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# Office of the Inspector General

Commonwealth of Massachusetts



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## A Review of the Central Artery/ Tunnel Project Cost Recovery Program

**Robert A. Cerasoli**  
Inspector General  
December 2000



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*Omnibus ad quos praesentes literae pervenerint, salutem.*

I am today releasing a report concerning the cost recovery program for the \$14.1 billion Central Artery/Tunnel Project (Project). The purpose of this review was to assess Project management's efforts to implement the program. This report identifies systemic vulnerabilities to waste and abuse, points out opportunities for increased cost control and accountability, and seeks to assist Project leaders in overseeing and strengthening Project operations.

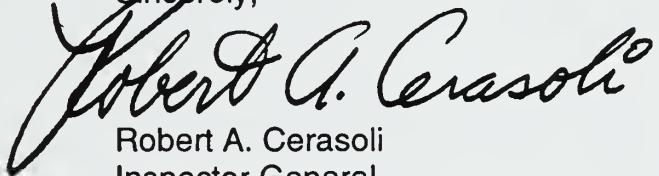
At the end of this Office's detailed review, Project managers initiated a number of corrective actions that show promise for revitalizing their cost recovery efforts. Until that time, efforts to assess contract cost increases for potential recovery action had stagnated, offering little assurance that design professionals, including Bechtel/Parsons Brinckerhoff, would be held accountable for deficient design work through the cost recovery program.



This Office provided ample opportunity for Project officials at the Massachusetts Turnpike Authority and Federal Highway Administration to respond to earlier drafts of this report. I have included their written responses in the appendices.

Taxpayers deserve every legitimate effort to contain costs and hold consultants accountable for their work. The Project cost recovery program provides one of many avenues available to management for achieving that objective. Because of the potential public benefits of this program, I urge Project officials to continue to pursue corrective action. As always, this Office stands ready to provide assistance.

Sincerely,



Robert A. Cerasoli  
Inspector General



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## ***Executive Summary***

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The \$14+ billion Central Artery/Tunnel Project (the Project) involves constructing and reconstructing 7.5 miles of urban roads. Project construction includes replacing the current elevated Central Artery (I-93) with an underground highway, extending the Massachusetts Turnpike (I-90) to East Boston through a new tunnel under Boston Harbor, and building a new bridge across the Charles River. According to federal and state officials, the Project is the most complex and costly urban highway project ever undertaken in American history.

In the early 1980s, the Massachusetts Highway Department (MassHighway, formerly the Department of Public Works) was responsible for planning the Project, as well as overseeing the design and construction of road and bridge projects throughout the state. In 1985, MassHighway hired the joint venture of Bechtel/Parsons Brinckerhoff (B/PB) to manage the design, construction, and day-to-day operations of the Project. In 1997, the Massachusetts Turnpike Authority (MassPike) was designated the owner/operator of the Metropolitan Highway System and gradually took over management of the Project from MassHighway.

In general, “cost recovery” is the process by which “public and private owners file claims against design and construction management professionals for the costs claimed to be attributable to errors, omissions, or other ‘deficient’ or unsatisfactory performance (‘cost recovery claims’).”<sup>1</sup> This report focuses on MassPike’s cost recovery program for the Project, and assesses whether MassPike: (a) developed an independent and viable cost recovery program for the Project; (b) ensured that staff adhered to reasonable procedures; and (c) pursued the cost recovery program objectives in a prudent, well-documented, and timely manner.

The Office’s review of the Project cost recovery program covered the period of time from Project management’s July 1994 introduction of a cost recovery procedure through

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<sup>1</sup> David J. Hatem, “Errors/Omissions Cost Recovery Claims against Design and Construction Management Professionals.” *The CAT Professional Liability Reporter* 1.4 (1996): 1.

implementation as of August 2000. This report identifies systemic vulnerabilities to waste and abuse, points out opportunities for increased cost control and accountability, and seeks to assist Project leaders in overseeing and strengthening Project operations. The Office's review, which focused on the Project's 62 closed cost recovery cases, disclosed the following:

- Finding 1.** In six years, the Project has only recovered \$30,000 from about \$83.5 million in cost recovery related change orders.
- Finding 2.** The Project set up the cost recovery program primarily to ensure federal funding, not to recover costs.
- Finding 3.** B/PB's overly broad role in Project management undermines the Commonwealth's ability to hold B/PB accountable for its design work.
  - The Project failed to pursue cost recovery against B/PB.
  - Changes to the cost recovery procedure reflect the Project's increased reliance on B/PB.
  - Internal organizational relationships impede MassPike's ability to hold B/PB accountable for its performance.
  - B/PB's conflicting interests in the cost recovery program serve as yet another example of the vulnerabilities of the current contractual arrangement.
- Finding 4.** Project management directed B/PB to subcontract for the services of the consultant responsible for assessing B/PB's potential liability for cost overruns.
- Finding 5.** The cost recovery program shows serious signs of neglect.
  - On average, Project staff took more than a year (394 days) to close cost recovery cases.
  - Project staff lost or misplaced many cost recovery files.
  - The Project does not, under the cost recovery program, actively pursue alternative methods of cost recovery.

- Project managers limited the cost recovery program to design-related issues.
- Many of the cost recovery case files are incomplete.

**Finding 6. The Project does not adequately document cost recovery cases.**

- The unsigned and undated closing memoranda contain information that is not in the records in the file.
- The Project's closing memoranda do not accurately document the review process or adequately document the cost recovery committee's rationale for recommending no further action.

**Finding 7. The cost recovery procedure examined during this review does not mandate the use of stated criteria nor does it provide adequate guidance for identifying and pursuing cost recovery actions.**

- The cost recovery program fails to provide guidelines or training to staff members, including resident engineers, who are closest to the issues.
- The cost recovery procedures do not adequately describe the responsibilities and objectives of the cost recovery committee.
- The committee may revise the procedures without written justification.

**Finding 8. In some cases, the Project failed to assess accurately the full cost impact of deficient design work.**

**Finding 9. Project management eliminated an effective method for catching potential cost recovery actions that B/PB staff may have missed.**

The large share of Project costs to be funded by the Commonwealth lends urgency to Project leadership's responsibility to control costs and send an unequivocal message: public officials, designers, and contractors of every sort will be held accountable for their work. The cost recovery program offers an opportunity to underscore that message and reduce the net cost of the Project. As documented in this report, it has been a missed opportunity.

To its credit, Project management worked with the Federal Highway Administration to ensure federal financial participation in tens of millions of cost recovery related change orders. The Project also deserves credit for issuing a new revision of its cost recovery procedure, which responds to some of the concerns of the Office. The Project provided a copy of the revised procedures to the Office during the final production stages of this report. The Office will examine the new procedure and comment if necessary.

Project leadership should consider the following recommendations as it continues recent efforts to revitalize its cost recovery program efforts:

- 1. Revisit the earlier decision not to regard the cost recovery program as an opportunity to cut costs or reduce the net cost to taxpayers.**
- 2. Use the cost recovery program to send a clear message that all design professionals on the Project will be held accountable for their design work.**
- 3. Reassess the basis for determining whether to pursue a cost recovery case.**
- 4. Avoid conflicts of interest by ensuring that MassPike or MassHighway, not B/PB, contracts directly for any services aimed at assessing B/PB's liability for design deficiencies and cost overruns.**
- 5. Delink the B/PB and MassPike organizations.**
- 6. Define clearly and follow through on the purpose and processes of the cost recovery program procedures.**
- 7. Provide training and guidelines to increase the likelihood that those closest to the issues in the field, including resident engineers, identify cost increases caused by deficient design.**
- 8. Explore and vigorously pursue cost recovery opportunities that go beyond the current program boundaries to include recovery actions for construction management issues and indirect cost overpayments to consultants.**

## ***Introduction***

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### **About This Report**

In discussing the massive and complex \$14+ billion Central Artery/Tunnel Project (the Project), it is difficult not to use acronyms and technical terms that will be unfamiliar to some readers. This report, therefore, includes a glossary of pertinent terms at Appendix C.

Many of the problems documented in this report originated before Project management began its transition in 1997 from the Massachusetts Highway Department (MassHighway) to the Massachusetts Turnpike Authority (MassPike). Where needed in order to avoid confusion, however, we refer to MassPike as the public owner and responsible agency throughout the discussion of findings in this report.

### ***Review Objectives and Scope of Work***

The Office's review objectives included assessing whether MassPike had: (a) developed an independent and viable cost recovery program for the Project; (b) ensured that staff adhered to reasonable procedures; and (c) pursued the cost recovery program objectives in a prudent, well-documented, and timely manner.

The Office's review of the Project cost recovery program covered the period of time from the Project's July 1994 introduction of a cost recovery procedure through implementation as of August 2000. Since July 1994, the Project has identified 92 potential cost recovery cases – that is, instances of increased costs that may have resulted from the errors and omissions, or other deficient performance, of design professionals. The Office's review focussed on the Project's 62 closed cost recovery cases.

In conducting this review, staff of the Office reviewed documents provided by the Project and other public entities, and interviewed staff from the Project, MassPike, MassHighway, and the Federal Highway Administration (FHWA). For comparative purposes, staff also reviewed documents and interviewed professional staff of several

public agencies that have been charged with overseeing megaproject design and construction. Staff devoted extensive attention to information provided by the Massachusetts Water Resources Authority (MWRA) on the MWRA's cost recovery program, which includes the \$4 billion Boston Harbor Cleanup Project.

## **Central Artery/Tunnel Project Overview**

### ***Project Description***

According to federal and state officials, the \$14+ billion Central Artery/Tunnel Project (the Project) is the most complex and costly urban highway project in American history. The Project involves constructing and reconstructing 7.5 miles of urban roads. Project construction includes replacing the current elevated Central Artery (I-93) with an underground highway, extending the Massachusetts Turnpike (I-90) to East Boston through a new tunnel under Boston Harbor, and building a new bridge across the Charles River. The Project is scheduled for substantial completion in 2004. The dense urban Boston environment, the need to keep traffic moving during construction, and the multiple stakeholders in the process contribute significantly to the challenges facing Project managers.

By using an approach commonly referred to as the “fast track” method of construction, the Project faces additional design and construction management complexities. Fast track construction involves the commencement of construction before all of the design is completed.<sup>2</sup> The Project entails hundreds of individual design and construction contracts. At any one time, multiple adjacent or interdependent contracts will be in different stages of design and construction. Therefore, unanticipated conditions, design problems, and delays on one contract may well have cost and schedule implications for many other related contracts. The numerous contract interfaces increase the importance (and difficulty) of design and construction management and coordination.

In September 2000, Project officials reported that approximately 98 percent of design and 62 percent of construction work had been completed. For the same reporting period, the Project’s schedule calls for substantial completion in 2004, although Project officials have indicated that they are revisiting the schedule and the costs associated with keeping to that plan.

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<sup>2</sup> Daniel S. Hapke, Jr., Design and Construction Contracts, Representing the Owner, (American Bar Association 1987) 55.

## ***Management History***

In the early 1980s, MassHighway was responsible for planning the Project, as well as overseeing the design and construction of road and bridge projects throughout the state. In 1985, MassHighway hired the joint venture of Bechtel/Parsons Brinckerhoff (B/PB) to manage the design, construction, and day-to-day operations of the Project.

Since 1985, the Commonwealth has paid B/PB more than \$2 billion to manage the design and construction of the Project facilities through a series of 14 contracts, also known as "work programs." The current contract (work program 14) originally stipulated an ending date of September 30, 1999 at a cost of not more than \$505,988,200. A series of 21 amendments has modified the scope of the contract, increasing the cost to a current maximum value of \$654,120,943. The most recent amendment, number 21, extended the completion date for the scope of services to January 31, 2001.<sup>3</sup>

Until the spring of 2000 when the newly appointed MassPike Chairman initiated a review of the Project management organization, Project staff had been negotiating the fifteenth work program with B/PB. Project management suspended negotiations while the new MassPike leadership completed its review and determined the appropriate roles for consultants, including B/PB, and agency and authority staff. At this writing, Project management expects to begin work program 15 in February 2001.

Under the terms of its contractual arrangement with the Commonwealth, B/PB has responsibility for planning and preliminary design and overseeing – and, in some cases, performing – final design work. B/PB also conducts value engineering reviews and other quality control measures; oversees soils testing and remediation; prepares construction bid packages; oversees construction contracts; negotiates construction contract changes and claims; and processes invoices. In addition, B/PB maintains management information systems, including cost and schedule controls and planning, and performs many other functions, including general record keeping. As will be

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<sup>3</sup> Amendment number 21 also provided for an additional five month extension to June 31, 2001 for the limited purpose of funding the reserve for the indirect cost basis adjustment as necessary based on final audit.

discussed in the findings section of this report, B/PB also participates in – and is subject to – the cost recovery program.

Although B/PB remains under contract with MassHighway, B/PB in effect now serves under the direction of MassPike under terms of a 1997 agreement between MassHighway and MassPike. The arrangement reflects the shifting ownership of Project facilities from MassHighway to MassPike as part of the Metropolitan Highway System.<sup>4</sup>

The current organization of the Project is unique, even among publicly funded megaprojects, which may differ significantly from the way the public owner typically operates. According to Project materials, the Project is a partnership among MassPike, MassHighway, B/PB, and the FHWA, as well as the city of Boston, local agencies, and other entities affected by the Project. Under MassPike's leadership, Project officials have created what they refer to as an "integrated project organization," combining MassPike employees and B/PB employees in the same organization. According to Project documents, Project leadership designed the integrated project organization to match staff members' technical and managerial skills to jobs without regard to the organization of origin (i.e., the entity paying their salaries).

### ***Budget and Finance***

From early 1997 to early in 2000, Project officials had steadfastly maintained that the cost to complete the Project would not exceed \$10.8 billion, despite the concern expressed by federal and state oversight agencies that Project officials had based the figure on overly optimistic and possibly faulty assumptions. On February 1, 2000, Project officials announced an estimated cost increase of \$1.4 billion. Subsequent federal and state reports estimated the cost overrun at closer to \$2.4 billion and predicted that the Project price tag would likely exceed \$14 billion. According to an agreement signed by FHWA and MassPike officials in June 2000, federal funding

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<sup>4</sup> Chapter 3 of the of the Acts of 1997 established a plan for operating and financing a network of roadways, including the Central Artery and the Ted Williams Tunnel, called the Metropolitan Highway System (MHS). The law, codified as M.G.L. c.81A, empowers MassPike to "own, construct, maintain, repair, reconstruct, improve, rehabilitate, finance, refinance, use, police, administer, control and operate" the MHS.

available for the Project will not exceed \$8.549 billion. Any amount over the \$8.549 billion, which is a maximum but not a guaranteed amount, will come from Commonwealth coffers.

## **Cost Recovery**

### ***Project Cost Recovery Program Overview***

In general, “cost recovery” is the process by which “public and private owners file claims against design and construction management professionals for the costs claimed to be attributable to errors, omissions, or other ‘deficient’ or unsatisfactory performance (‘cost recovery claims’).”<sup>5</sup> Some agencies, such as the MWRA, construe the term even more broadly to encompass additional activities such as examining construction contractor records to verify certain change order pricing and seeking the return of indirect cost overpayments from firms under contract for professional services.

The Project cost recovery program is limited to design work, including design management. Claims for construction are handled separately. Cost recovery against design professionals covers “claims made by clients and others that they have suffered losses that should be transferred to the design professional.”<sup>6</sup> The term “design professional” refers to the project architect and/or engineer.<sup>7</sup> A design professional may be held liable for negligent acts or omissions committed either in the preparation of plans and specifications or in the administration or inspection of the work of construction contractors.<sup>8</sup>

While the term “cost recovery” may suggest that the program is part of the Project’s cost containment efforts, such as the “design-to-cost” and claims avoidance initiatives, the

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<sup>5</sup> David J. Hatem, “Errors/Omissions Cost Recovery Claims against Design and Construction Management Professionals.” The CAT Professional Liability Reporter 1.4 (1996): 1.

<sup>6</sup> Justin Sweet, Legal Aspects of Architecture, Engineering and the Construction Process (West Publishing, 5<sup>th</sup> edition, 1994) §14.01 at 254.

<sup>7</sup> Neal J. Sweeney, et al., eds. Smith, Currie & Hancock’s Common Sense Construction Law (John A. Wiley & Sons, Inc., 1997) 64.

<sup>8</sup> Robert F. Cushman, et al., eds. Construction Litigation, Representing the Owner, (John Wiley & Sons, Inc., 2nd edition, 1984, 1990) 64.

Project does not view it as such. Project staff distinguish the **recovery** of money spent from efforts to **contain** potential costs.

The cost recovery inquiry process typically begins during the claims and changes process. Staff from FHWA, MassPike or B/PB may initiate a preliminary cost recovery inquiry by indicating on the contract modification<sup>9</sup> form that the increased costs associated with the change may have resulted from a design error or omission. The change order then proceeds through the customary claims and changes process and the cost recovery matter itself is handled as a separate matter through the cost recovery program.

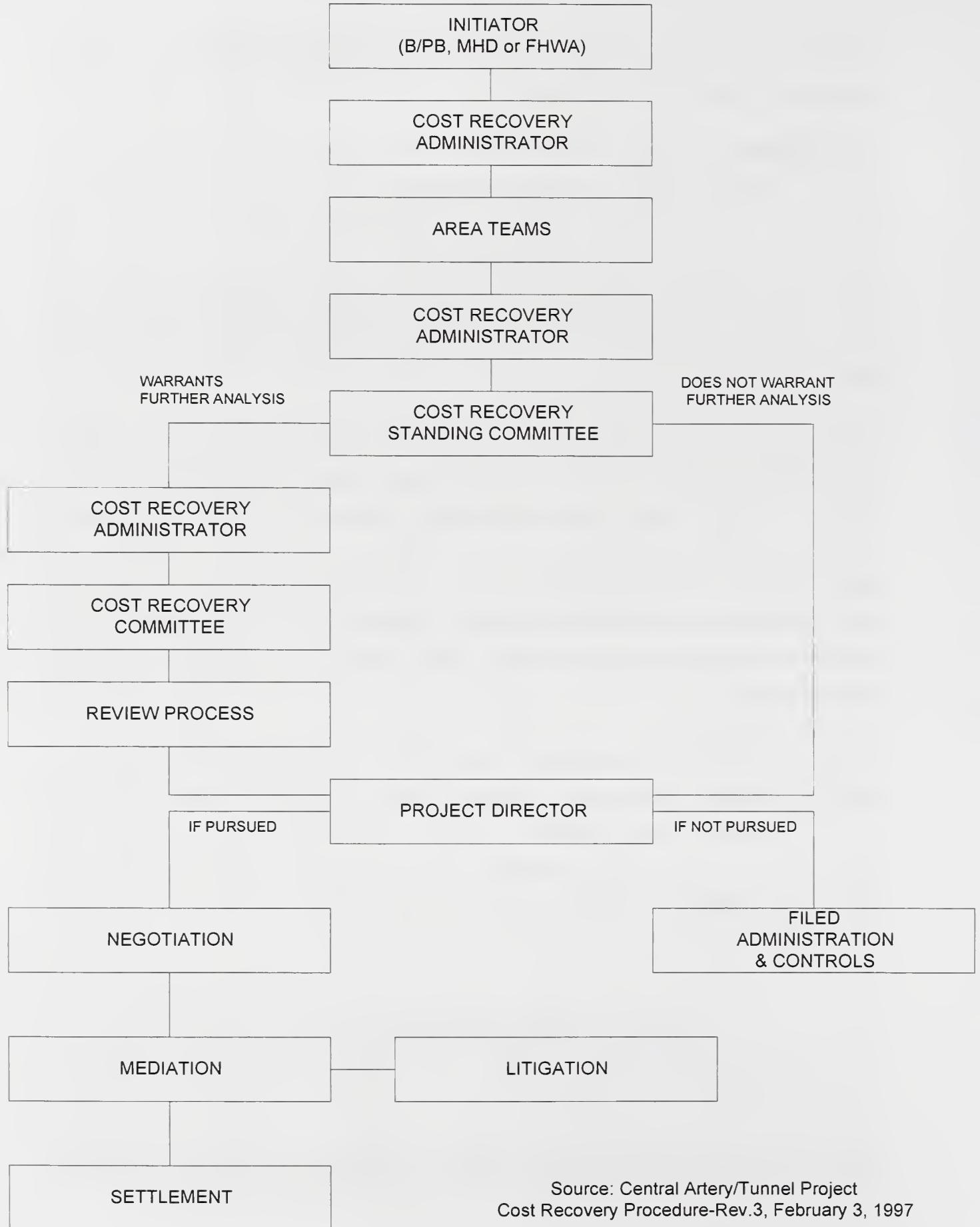
The cost recovery standing committee – comprised of the Project Director of Design and the Director of Construction (both MassPike employees), and the FHWA Project Engineer – reviews change orders to construction contracts and amendments to design contracts that B/PB, MassHighway, and/or FHWA staff identified as possibly having been caused by the deficient performance of design professionals. The committee determines whether sufficient evidence exists to justify pursuit of the designer for costs incurred or damages suffered by the Commonwealth as a result of the allegedly deficient design work.

However, the Project Director has the final word on whether an action against a designer is pursued. If the Project Director decides to pursue cost recovery, the matter may be negotiated, mediated, litigated, or settled. If the Project Director decides not to pursue cost recovery, the case is closed. (For more detailed program information, see the graphic on page 8.)

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<sup>9</sup> Contract Modifications (MODs) are written notices to a contractor that identify proposed contract changes. An approved MOD contains the scope, cost, and estimated time impact of the change.

# CENTRAL ARTERY/TUNNEL PROJECT COST RECOVERY PROCEDURE



Source: Central Artery/Tunnel Project  
Cost Recovery Procedure-Rev.3, February 3, 1997

## ***Findings***

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**Finding 1. In six years, the Project has only recovered \$30,000 from about \$83.5 million in cost recovery related change orders.**

In April 1998, the Project recovered \$30,000 from three of its 92 cost recovery cases.<sup>10</sup> Neither the Project's documents nor interviews with the Project's staff showed evidence of any other funds recovered before or after that time. The Project did not recover this money directly from designers. Rather, the Project settled the three cost recovery cases for \$30,000 from insurance the Project – not the designer – had purchased.

According to documents provided by the Project, staff had closed 62 of the 92 cost recovery cases identified as of August 2000. Project documents attributed a total estimated value of about \$27.3 million to change orders associated with the closed cases. Thirty of the 92 cost recovery cases remained open as of August 2000. Project documents attributed a total estimated value of over \$56.2 million to change orders associated with the open cases. The Project has to date recovered only \$30,000 from 92 potential cases with an estimated total value of \$83.5 million in change orders on a \$14+ billion construction project, including more than \$1 billion in construction contract change orders. The remarkably small recovery amount suggests an ineffective program.

**Finding 2. The Project set up the cost recovery program primarily to ensure federal funding, not to recover costs.**

As the previous finding shows, the program has been ineffective at recovering costs. Yet, the Project continued to invest in this program, despite its failure to yield results. Project documents and statements of federal officials indicate that the primary purpose of the program was to ensure federal funding of change orders involving potential cost recovery claims.

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<sup>10</sup> Project staff uses the term "cost recovery inquiry (CRI)" rather than "cost recovery case." This report uses the latter simpler term and avoids acronyms wherever possible.

FHWA officials told staff of the Office that they refused to fund the first couple of Project change orders that involved potential design deficiencies. This action was consistent with FHWA policy, which generally states that each case should be considered on its own merits.<sup>11</sup> According to FHWA officials, Project managers approached them out of concern that they would have to fund these and other change orders with state money.

FHWA agreed to fund 100 percent of the eligible costs associated with Project change orders caused by potential design deficiencies. In exchange, FHWA asked Project managers to develop and follow a cost recovery procedure. FHWA would approve the procedure and have a role in the cost recovery process. According to the recollections of FHWA officials interviewed by the Office, FHWA had never before or since then entered into such an arrangement with a state highway agency. In fact, FHWA officials were not aware of any similar formal cost recovery program, public or private. Federal officials told the Office that state highway agencies generally respond to a specific cost recovery case, rather than having a formal program in place.

By letter in July 1994, the Project Director informed B/PB and FHWA that MassHighway would begin implementing a cost recovery procedure immediately. FHWA officials interviewed by the Office indicated that they were satisfied with the Project's effort to review and analyze claims that may have involved deficient design professional performance.

Documents provided to the Office by Project staff members corroborate FHWA's statement of satisfaction with the program. The Office's review, including interviews with FHWA officials, disclosed no instance where FHWA withheld funding because of the potential that a change order was necessitated by deficient designer performance. Similarly, neither documents nor interviews disclosed any instance in which FHWA withdrew funding already granted because MassPike failed to recover costs incurred due to deficient performance by design professionals. To the credit of Project managers, this arrangement with FHWA has ensured federal financial participation in

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<sup>11</sup> U.S. Department of Transportation, Federal Highway Administration Contract Administration Core Curriculum, Participant's Manual and Reference Guide (1997) 117.

the estimated \$83.5 million in change orders associated with the Project's 92 open and closed cost recovery cases.

But, as documented in the previous finding, Project management's cost recovery actions have yielded only \$30,000. In response to questions from the Office regarding the minuscule amount of costs recovered, Project managers replied that they never intended the cost recovery program to be a revenue-producing endeavor. Instead, according to the Acting Project Director, they wanted to have a program in place in case of a catastrophic occurrence that was caused by deficient design professional performance.

Project managers did acknowledge, during the same interview, that the cost recovery program had not received the attention it deserved. As a result of that neglect, the Project passed up opportunities to recover costs and to send the clear message that MassPike will hold designers accountable for their work. This report documents the evidence and implications of program neglect.

**Finding 3. B/PB's overly broad role in Project management undermines the Commonwealth's ability to hold B/PB accountable for its design work.**

B/PB's role in design permeates its management consultant function:

*Preliminary Design:* As the Project's preliminary designer, B/PB develops section designs to the point of sufficient detail (about 20 to 25 percent, including 40-scale drawings) to permit outside section design firms to proceed with final design.

*Design Management.* As the Project's design manager, B/PB coordinates the work of all design disciplines toward achievement of Project objectives. B/PB as design manager provides support to MassPike's cost recovery procedures, among other responsibilities.

*Construction Management.* As the Project's construction manager, B/PB provides contract changes and claims administration services for all Project construction contracts.

The Project's cost recovery program permits – and in some cases requires – B/PB to review the work of final design firms. Work program 14 explicitly added cost recovery services to B/PB's responsibilities. The contract, including the following language, goes beyond mere technical support to include analysis of the potential for cost recovery actions:

[R]eview of plans, specifications, and correspondence; review of design and construction PCNs,<sup>12</sup> contractor proposals, contract modifications; support Area Team analysis where requested; provide written reports and recommendations where necessary and appropriate; attend sessions of the cost recovery committee, and provide technical assistance to the Area Teams and Committee where appropriate or as requested by the DEPARTMENT.

The Office would not object to B/PB providing analytical support in cases where B/PB could not be the target of a cost recovery action. But because of B/PB's involvement in nearly every aspect of the Project, it is difficult to identify a situation where B/PB is not potentially responsible for a design error or omission.

In most instances, the final design firm based its work on the preliminary designs B/PB prepared. B/PB's review responsibilities extend well beyond the design phase and into construction. For instance, B/PB staffs the claims and changes unit, which assesses the reasonableness of the costs of contractor claims (delays, unanticipated subsurface conditions, etc.). The unit also reviews charges for changes that were directed by the Project, including billings based on time and materials rather than on amounts that were included in the contractor's competitive bid submission.

B/PB's multiple roles in preliminary design, final design, and cost assessment (change orders) impedes MassPike's ability to hold B/PB accountable for its performance. The cost recovery program simply underscores MassPike's reliance on B/PB and the vulnerabilities of that arrangement.

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<sup>12</sup> Pending Change Notices (PCNs) were written notices to a contractor that identified proposed contract changes. An approved change order contained the scope, cost, and estimated time impact of the change. The Project now refers to change orders as contract modifications (MODs).

**3a. The Project failed to pursue cost recovery against B/PB.**

One example clearly illustrates how B/PB's responsibilities compete with one another and the impact on the cost recovery process: the installation of anchor bolts during the construction of the Ted Williams Tunnel (TWT). B/PB's contract with the Commonwealth required B/PB to develop the preliminary design for the TWT and to coordinate the final design work for the different elements of the TWT. These different elements included the shell of the TWT, the tunnel finishes for the completed shell, and the interface between the tunnel and the connecting roadways. The anchor bolt issue in this particular example deals with the relationship between the design of the tunnel shell and the design of the tunnel finishes.

After work commenced to prepare the TWT for traffic under the tunnel finish contract, the construction contractor encountered numerous difficulties. A major difficulty involved installing a tunnel ceiling. The design called for the ceiling to be anchored – by bolts – to the previously constructed tunnel roof. However, the roof design did not make allowances for a ceiling anchoring system. As a result, the Project issued nearly \$850,000 in change orders to the construction contractor for additional work.

The change orders resulted from poor design coordination and unclear design specifications.<sup>13</sup> Among other reasons, the Commonwealth hired B/PB to coordinate designs and ensure that construction contractors based their bids and their work on clear instructions. In fact, during an interview with the Office, staff from the final design firm responsible for tunnel finishes stated that they based the ceiling design on B/PB's preliminary design and that B/PB prepared some of the specifications that led to the ceiling installation change orders.

Clearly, B/PB's responsibility for these change orders should have been the subject of discussion in the cost recovery process. However, there is no evidence in documents

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<sup>13</sup> The Office released a report, *A Review of the Central Artery/Tunnel Project's Use of Anchor Bolts on the C05B1 Tunnel Finishes Contract*, that detailed how poor design specifications and inadequate oversight cost the Project an additional \$850,000. The December 1998 report may be viewed or downloaded from the Office's web site at [www.state.ma.us/ig](http://www.state.ma.us/ig).

provided by the Project that the Project attempted to assess B/PB's liability in connection with this work.

In response to the Office's criticism in 1998 of B/PB's handling of the anchor bolt issue, a MassPike Project official replied that the changes resulted from a "confluence of conditions" and that every "possibility and circumstance" cannot be anticipated. The Project official did note, however, that the design of future ceiling anchoring systems would be changed as a result of these "lessons learned."

The cost recovery committee should have at least considered the matter of deficient design coordination. As has been discussed elsewhere in this report, if the committee decided to pursue the issue through the cost recovery process, it would be almost entirely dependent upon B/PB to provide the information and technical expertise necessary to assess its own liability.

B/PB's multiple roles in design, administration, and construction, create an inherent management conflict. B/PB's almost total control over Project information intensifies this conflict. B/PB's overwhelming control of all facets of the Project, make it nearly impossible for B/PB to perform an independent or objective analysis.

**3b. Changes to the cost recovery procedure reflect the Project's increased reliance on B/PB.**

Amendments incorporated into the most recent version of the Project procedure available during this review, dated February 3, 1997, permit a B/PB representative to attend meetings of the cost recovery committee and to assist in the analysis of cost recovery issues. Part I of the procedure provides in part: "At the discretion of the Standing Committee, a Bechtel/Parsons Brinckerhoff (B/PB) representative, usually the Design Core Manager, may be asked to attend certain Standing Committee meetings." The procedure provides in part: "B/PB may be asked to assist in the analysis of the cost recovery issue. Such request will typically be made through B/PB's Cost Recovery Committee representative." The more explicit reliance on B/PB for technical analysis

underscores MassPike's dependence on B/PB even where B/PB could be the target of the cost recovery action.

**3c. Internal organizational relationships  
impede MassPike's ability to hold B/PB  
accountable for its performance.**

The integrated organizational structure now in place at the Project further confounds any attempt to make B/PB the focus of a cost recovery action. Currently, for example, one of the three members of the cost recovery committee reports to a B/PB senior staff member on a day-to-day basis. Although all three committee members are public sector employees, the organizational relationship of at least one member of the committee to B/PB creates a potential for conflict of loyalties and interests. The arrangement illustrates MassPike's compromised position in any attempt to hold B/PB accountable for its performance.

**3d. B/PB's conflicting interests in the cost  
recovery program serve as yet another  
example of the vulnerabilities of the current  
contractual arrangement.**

Ordinarily, the Office would recommend that MassPike take control of cost recovery on the Project by performing the services in-house or competitively procuring an independent contractor. But simply excluding B/PB from the process altogether will not remedy the problem. B/PB controls documents and data that MassPike staff (or an independent consultant) would require for conducting an impartial and thorough inquiry.

The Office has repeatedly warned public officials about the vulnerabilities of the contractual relationship between B/PB and the public owner, whether that be MassHighway or MassPike. In a June 1996 letter to the Project Director concerning Work Program 14, the Office offered the following for future consideration:

The Project should consider reconfiguring the design and construction management of the CA/T Project, including competitive procurement of construction management services under a contract separate from the engineering and design management.

And again in May 2000, the Office alerted the newly appointed MassPike Chairman to issues that had been inadequately addressed in the past:

The Commonwealth's excessively broad project management contract with Bechtel/Parsons Brinckerhoff has impeded effective cost control and oversight, undermined public accountability on the CA/T Project, and eroded the Commonwealth's contracting leverage.

The MassPike Chairman advised the Office that the contractual arrangement with B/PB was under review, along with other important matters. But to date, the Office has received no official statement of the results of that review. The Office surmises from draft contract documents available so far that the Project will extend rather than limit the Commonwealth's dependence on B/PB.

**Finding 4. Project management directed B/PB to subcontract for the services of the consultant responsible for assessing B/PB's potential liability for cost overruns.**

In the case documented below, the Project contracted for reviews to include determining whether cost recovery action should be pursued against B/PB due to potentially negligent or inefficient actions in the development of the design package.

B/PB's preliminary design of the Fort Point Channel Crossing, located in South Boston, involved the design and construction of two multi-lane highway tunnels placed under active railroad tracks, over the Massachusetts Bay Transportation Authority's Red Line subway and between the United States Postal Annex and the Gillette Company. The preliminary cost estimate for construction of the Fort Point Channel Crossing was \$516 million, with a completion date of late 1998. According to a Project report dated August 31, 2000, completion will be delayed until mid-2002. Project officials reportedly

estimated earlier this year that the cost of the redesigned crossing would exceed \$1.1 billion.<sup>14</sup>

In May 1995, MassHighway amended the scope of an existing consulting contract with Peterson Consulting Limited Partnership (Peterson) to add cost recovery services, including the Fort Point Channel issues. Peterson submitted a report draft on the Fort Point Channel matter to the Project in December 1995.

MassHighway's contract with Peterson ended in July 1996. Four months later, in November 1996, MassHighway directed B/PB to sign a sole-source contract with Barrington Consulting Group for cost recovery services retroactive to July 1996, the date when the MassHighway contract with Peterson ended. The project leader on cost recovery issues for Barrington was the same individual who had provided cost recovery services – including the earlier report draft – under MassHighway's contract with Peterson. The scope of work expanded and the maximum estimated compensation due Barrington under its subcontract with B/PB increased more than sixfold from \$250,000 in 1996 to more than \$1,600,000 by the end of 1999.

In April 1998, Barrington completed the cost recovery review of the Fort Point Channel issue, which Project staff described to the Office as a continuation of Peterson's earlier work. The report concluded, as had the previous draft submitted under Peterson's contract, that B/PB had performed its tasks with a reasonable standard of care and no cost recovery action should be pursued.

Project staff members interviewed by the Office explained that having B/PB subcontract with the consultant was judged at the time to be the most efficient way to handle payment, but that MassHighway directed the consultant's services. Under this arrangement, the consultant charged with assessing B/PB's potential liability for cost

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<sup>14</sup> According to a report issued by the State Auditor's Office in February 2000 (Report No. 98-4061-3), at least two factors contributed to the cost increases and schedule delays for designing and constructing the Fort Point Channel Crossing: MassHighway's (now MassPike's) inability to resolve in a timely manner the debate about the adequacy of B/PB's circular cofferdam preliminary design and the delay in resolving Ramp "L" design problems. The Auditor's Office reported that the design delays increased construction costs by approximately \$13 million and the Project incurred redesign costs of \$6.4 million.

overruns was working under a subcontract with B/PB. In this instance, what may have been expedient at the time resulted in an administrative arrangement that created an inherent conflict of interest.

**Finding 5. The cost recovery program shows serious signs of neglect.**

During the first three years of the program (mid-1994 to mid-1997), the Project opened 87 cost recovery cases. In the three years since then, the Project opened only five new cases. Project managers explained that the absence of new cases was due, in part, to the fact that the Project and FHWA stopped sending the smaller issues to cost recovery.

In response to the Office's statements concerning the preliminary results of the review documented in this report, Project staff acknowledged that the cost recovery program had not received the attention it deserved. Both Project and FHWA staff noted that they were in the process of revitalizing the cost recovery effort.<sup>15</sup>

**5a. On average, Project staff took more than a year (394 days) to close cost recovery cases.**

The Project produced data on 57 of the 62 closed cases identifying when the cases had been opened and closed. Nine of the cases languished for close to or more than two years, and five of those cases stayed open with little evidence of activity for three years or more. Project records show that, on average, six months elapsed between the day someone noted on the change order form that the additional costs may have been caused by deficient design work and the day the standing cost recovery committee conducted a preliminary review of the matter.

In the following example, the case remained open for three years. Project staff took a year to conclude the case inquiry and the Project Director did not sign the closing memoranda until nearly two years later.

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<sup>15</sup> Refer to the conclusions section of this report and the Project's letter of response for more detailed information on the Project's initiatives.

### ***Cost Recovery #39: Wall thickness change***

According to Project documents, this matter resulted from the Section Design Consultant's approval of the contractor's shop drawings even though these shop drawings differed from the contract design. The contract drawing and the shop drawings illustrated different wall thickness transitions at a point in the roadway. The contractor proceeded to construct the wall thickness transition in accordance with the designer-approved shop drawings. A B/PB field engineer pointed out the discrepancy to the contractor who sent a Request for Information (RFI)<sup>16</sup> to the resident engineer requesting clarification. The matter of the Section Design Consultant's apparent failure to notice the error was at issue.

The contractor's shop drawings were not in accordance with notes contained in the plans that required a more gradual wall thickness transition. B/PB's response to the contractor's RFI clarified that a 45-degree transition was required. As a result, the contractor claimed that it had to refabricate rebar and re-erect formwork to provide the 45-degree transition. Construction Contract C04A2 (I-90 BMIP Tunnel), PCN 109 was settled for \$14,312.

On a cost recovery inquiry form dated July 26, 1995, the area team did not recommend further analysis, stating that it was "[n]ot a clear issue nor cost effective to recover \$14,000." Nearly two months later, on September 13, 1995, the cost recovery committee noted its disagreement with the area team's recommendation not to pursue the matter. Seven months later, the Project director concurred and sent a cost recovery letter to the designer dated April 29, 1996.

The designer's reply of May 29, 1996, vigorously challenged the Project's actions. In a memorandum dated only by a fax stamp of July 19, 1996, the area team recommended, after its review of the designer's response, that action be taken, thereby reversing its earlier position recommending no further action. In a July 22, 1996 file memorandum the cost recovery committee also reversed its original position and disagreed with the area team, finding that "no further action should be taken against the design professional." The Project Director did not approve the final disposition of no further action until nearly two years later, on June 18, 1998.

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<sup>16</sup> A request for information (RFI) is a document used by the contractor to request or to provide additional information clarifying comments relating to the construction contract.

During interviews with the Office, MassPike staff members said that they kept cost recovery issues open for long periods because they were too busy to pursue or close them. Documents disclosed no evidence that Project managers had heeded the advice of their management consultant in 1995 to ensure that the cost recovery committee established completion dates at the beginning of the review process.<sup>17</sup>

The current procedure contains various deadlines, but two key factors render the time constraints meaningless. First, the procedure sets no time limit for the standing committee's initial review of the potential cost recovery issue. And second, the procedure establishes no limit on the amount of time the MassPike Director of Design, the MassPike Director of Construction and the FHWA Project Engineer (that is, the standing committee) may take before they submit the final report to the Project Director.

#### **5b. Project staff lost or misplaced many cost recovery files.**

In response to oversight agency requests for cost recovery files, Project staff replied that some of the case files had disappeared. Material subsequently provided by Project staff at the Office's request shows that a total of 42 cases – three open cases and 39 closed cases (nearly two-thirds of the 62 closed cases) – are missing. Staff members explained to those who inquired, including the Office, that they believe the files disappeared when Project offices moved from One South Station to the current location at 185 Kneeland Street.

Project staff has assured the Office that efforts are underway to reconstruct the case files. It appears, however, that the effort is a low priority, in light of the fact that the move to Kneeland Street occurred more than two years ago, in the fall of 1998.

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<sup>17</sup> Summarized from Peterson Lemley's comments in its September 1995 CA/T Management Review, Phase II, pp. 4-8.

**5c. The Project does not, under the cost recovery program, actively pursue alternative methods of cost recovery.**

Project files and interviews with Project and FHWA clearly indicated that management strives to avoid litigation against designers. The Office does not question the need to weigh carefully the cost of litigation. Litigation is prohibitively expensive and suing a designer may cause delays or otherwise affect the designer's performance. However, the Office saw no evidence that the Project had pursued any of the alternative methods of recovery and alternative dispute resolution that are permitted under the cost recovery procedures. Documents indicated only infrequent use of the dispute resolution process described in the program procedures.

**5d. Project managers limited the cost recovery program to design-related issues.**

Project management, through its written procedures, limits the cost recovery program to examining instances where deficient design work, including design management, may have contributed to the cost or actually caused the need for change orders or contract add-ons. In contrast, the MWRA's approach to cost recovery includes efforts to recover indirect cost overpayments from consultants and actions against construction contractors, in addition to deficient designer performance.

The program does not seek recovery of costs attributable to such things as faulty construction and construction management issues. When questioned during interviews, Project officials explained that they handle claims against construction management professionals by way of contractual remedies and do not include those matters under the cost recovery program.

During interviews, Project staff described remedies available for holding B/PB accountable for its design and construction management performance, including cost recovery cases. However, the Office found no evidence that the Commonwealth has ever withheld any fees from B/PB or held them financially accountable for any design problems on the Project.

**5e. Many of the cost recovery case files are incomplete.**

Many of the files are missing back-up documentation, as will be discussed in Finding 6. The written procedures do not provide standards or guidelines for documentation requirements.

**Finding 6. The Project does not adequately document cost recovery cases.**

With few exceptions, the Project's cost recovery files contain incomplete information and vague analyses. The absence of sound documentation is especially troubling in light of the complex engineering issues under consideration.

Currently, Project staff drafts a so-called Cost Recovery Item Disposition Memorandum (closing memorandum) for each closed cost recovery case. According to records provided to the Office by the Project, the Project has written these memoranda for about the last twenty-five cost recovery cases that have been closed. Prior to that, cost recovery cases were closed without any written documentation.

Project staff told the Office that Project legal staff or other Project staff write the closing memoranda. The Project has taken a step in the right direction by acknowledging the need to document the reasons for closing a case. However, as currently practiced, the closing memoranda are more often than not "boilerplate" statements that lack complete information and introduce information not otherwise documented in the file.

The Project should have carefully documented all cases. The Office is concerned that the Project's open cost recovery cases also consist of undocumented files with no paper trail or chronology of events. Should the Project need to rely on its *open* cost recovery files for documentary evidence in litigation or insurance claims, such a dearth of information on file could undercut the Commonwealth's position.

Cost recovery #72, Dewey Square 30" gas alignment, is an example of a poorly documented case. Based on Project files and reports, the Office estimated that the cost associated with this case is \$618,747. The Project's file consisted of nine pieces of paper, including the legal department's referral of the matter to cost recovery. The area

team's recommendation – that the work would have been needed anyway and that no extra costs were involved – was not supported by any documentation. At a minimum, the cost recovery committee should have devoted more time and resources to this \$618,747 matter. Files such as this leave virtually no paper trail for legal, historical, or other purposes. Moreover, files in this condition do not provide the reviewer with any assurance that the cost recovery committee undertook a thoughtful and thorough review of the matter.

**6a. The unsigned and undated closing memoranda contain information that is not in the records in the file.**

The closing memoranda are poorly documented and fail to state pertinent information such as meeting dates – or any dates at all – and meeting attendees. Not one of the Project's closing memoranda reviewed by the Office is signed or dated. For example, the closing memoranda for cost recovery #39 went on at length about how the area team and cost recovery committee worked to achieve a "single mind" about closing an issue for which the cost recovery committee had originally recommended further review. But the document provides no clue as to when or by whom the information was recorded.

The following example, cost recovery #40, contains evidence of an incomplete review of a cost recovery case, and suggests that MassPike ignored an opportunity to determine if B/PB should be held responsible for a design-related problem.

The Project settled Modification A069 (PCN 131) for \$18,000. An existing fire water line which hung from the ceiling of the East Tunnel had to be relocated to eliminate interference with ceiling hangers and the ceiling exhaust air duct wall. A design error may have caused the fire water line interference.

The area team review, dated July 26, 1995, stated that the Project should pursue further analysis. The standing cost recovery committee concurred with the area team on September 13, 1995, recommending that a written cost recovery inquiry be sent to the

section design consultant (SDC) and B/PB concerning interfacing of contracts and timing of design.

In an unsigned and undated closing memorandum, the area team absolved the SDC of responsibility and recommended that the Project take no further action on the issue. However, a note in the file from a member of the area team to the cost recovery coordinator referenced another note. The referenced note suggested that the SDC coordinated as well as they could under the circumstances and that it may have been B/PB who did not coordinate or provide sufficient or timely information to the SDC:

I have reviewed the above referenced resubmittal which includes B/PB letter dated 2/25/97. This letter closes saying the SDC did not coordinate. However, attached to the package is a hand written tel-comm dated 1/2/97 . . . which is a chronology of events indicating that the plans in the area of concern were not finalized. **If this is so the oversight in this case and the cost recovery will be from B/PB.** [Emphasis added.]

There was no evidence in the file that the cost recovery committee acted on the area team member's note. The closing memorandum provided in part:

It appears that the information used by the C04A2 contractor received from the design professionals [B/PB and the SDC] was the best available information at the time it was presented.

The memorandum further provided that the problem "was not as a result of failure on the part of a design professional to adhere to the applicable standard of care or to a lack of coordination between the contracts, but rather a result of construction operations as they occurred in the field."

**6b. The Project's closing memoranda do not accurately document the review process or adequately document the cost recovery committee's rationale for recommending no further action.**

In another case, files did not allow a determination of whether a problem was an error (drawing too small) or an omission (no drawing at all). In the case discussed below, the closing memorandum stated that the sand drainage layer (the drainage system) was not

shown as large as actually required, but everywhere else in the file indicated that the sand drainage layer had been omitted from the drawing.

The following discussion of cost recovery case #73 further illustrates some of the documentation inadequacies, as well as the absence of careful cost analysis that will be discussed in Finding 8.

#### ***Cost Recovery #73: Drainage system (North Drumlin)***

On or about March 27, 1996, the Project initiated PCN 091 for the Materials Disposal System Contract (C21A2). The need for the contract change involved design drawings that did not show a complete drainage system. This affected erosion control. As a result, the drainage system had to be completed before other work could continue. This work required a cost increase. The Project settled the matter for \$456,447 (MOD A050).

The cost recovery committee's undated cost recovery inquiry form did not have an initial cost recovery review. The area team review provided in its entirety: "See attached letter from FHWA." The attached letter to the Project from FHWA dated June 4, 1996 provided in pertinent part:

We have reviewed PCN 091 which includes the change to the North Drumlin Drainage for Spectacle Island. Based on the additional information and discussions with your staff, we concur that there should be no cost recovery action taken against the SDC.

On September 23, 1996, the standing committee determined that the issue did not require further analysis. Fourteen months later, the Project Director finally approved the committee's recommendation to take no further action.

The Project completely ignored its own procedures, apparently basing its decision on a letter from FHWA. MassHighway's legal department characterized the situation as an omission, but the record shows no evidence that staff undertook a standard of care analysis. The cost recovery program deals mostly with errors and omissions, yet staff dismissed this omission, apparently because the basic work would have been required, in any case. Despite the fact that the change order documents referenced additional costs, such as delay costs and the contractor's maintenance of erosion in the North Drumlin area, staff failed to quantify these

costs or consider them for purposes of cost recovery.

Cost recovery #73 is comprised of a few pieces of paper, none of which reflects the “additional information and discussions” staff noted in the FHWA letter. The case also reflects a lack of communication between the cost recovery committee and MassHighway’s legal department. There is nothing in the file to indicate that the cost recovery committee considered input in August 1996 from MassHighway’s legal department. In this instance, the Project inexplicably allowed cost recovery issues to languish well beyond the point where they should be resolved, as shown by the gap of over a year between the standing committee review and final disposition of cost recovery #73.

**Finding 7. The cost recovery procedure examined during this review does not mandate the use of stated criteria nor does it provide adequate guidance for identifying and pursuing cost recovery actions.**

The Project’s cost recovery procedure fails to require the committee to apply criteria stated in the cost recovery procedure, including the professional standard of care, to assess the potential for cost recovery actions. According to a recognized expert in the field, application of the professional standard of care lies at the heart of any action for design malpractice:

A fair and balanced cost recovery process **must** utilize the professional standard of care as the basis for determining whether the design and construction management professional should be held responsible or legally accountable for a cost recovery claim.<sup>18</sup> [Emphases added.]

Contrary to the advice quoted above, the Project’s cost recovery procedure does not require the committee to apply the appropriate standard of care. Instead, it states that the standing committee, when determining whether the cost recovery issue warrants a cost recovery analysis, *may* consider the procedure’s criteria and cost/benefit analysis in Section III of the procedure. The procedures further provide that the inquiry “should” (rather than “must”) apply the enumerated criteria, *including* the professional standard of care.

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<sup>18</sup> David J. Hatem, “Errors/Omissions Cost Recovery Claims against Design and Construction Management Professionals.” The CAT Professional Liability Reporter 1.4 (1996): 15.

The absence of mandatory criteria invites suspicions that factors having no legitimate role in a fair, impartial analysis could have influenced the committee. A lack of consistent application of clear standards creates the potential for special treatment of favored designers and unnecessarily exposes the process to criticism.

**7a. The cost recovery program fails to provide guidelines or training to staff members, including resident engineers, who are closest to the issues.**

Project staff explained during interviews with the Office that engineering staff on the front lines – that is, resident and field engineers, and claims and changes analysts – are the first line of defense in identifying cost increases that may have been caused by the deficient performance of a design professional. The Office's review, however, revealed no indication that management provided those staff members on the front lines with training, orientation, or guidelines to promote the identification of these matters.

In response to questions, Project staff orally advised the Office that managers recalled some training in 1994 when they first introduced the new contract modification forms with the cost recovery option, but produced no documentation to support the recollection. The Project – and the public – could be missing out on opportunities to recover costs simply because those who are well positioned to identify problems have not been adequately encouraged or trained to do so.

**7b. The cost recovery procedures do not adequately describe the responsibilities and objectives of the cost recovery committee.**

Although Project officials purportedly used the MWRA procedures as a model, they did not follow the MWRA's lead in explicitly describing the committee's responsibilities. As has been discussed elsewhere in this report, the MWRA's cost recovery program reaches beyond the design community to include other deficient consultant performance. Nevertheless, the unequivocal statement of responsibility for the MWRA review committee could be instructive for the Project's procedures. The MWRA program procedures begin with the following statement:

The Committee shall be charged with the responsibility of reviewing various consultant activity work products or incidents to determine (1) if there are incidents of Deficient Consultant Performance, and (2) if a deficiency exists, the amount of Recoverable Costs associated with the deficiency.

The section on responsibilities also states:

The Committee shall also determine if the construction work performed subsequent to the design work would have been performed regardless of design deficiencies, or if the construction was additional or remedial and undertaken solely because of the design deficiency.

Unfortunately, the Project did not adopt these or similar statements that would specifically describe the Committee's responsibilities.

It should also be noted that the Project had not updated the cost recovery procedure to reflect MassPike's role in the cost recovery. The most recent cost recovery procedure available during this review was dated February 3, 1997 and entitled "Central Artery/Tunnel Project Cost Recovery Procedure." It included no other information that would identify the agency or public official that had approved the document. The Governor approved the MHS legislation on March 20, 1997. The cost recovery procedure had not been updated at the time of the Office's review to reflect this change.

**7c. The committee may revise the procedures without written justification.**

The cost recovery procedures state the following:

With the Project Director's approval, the Committee may revise the procedures and timing described above if deemed necessary to meet C/A/T Project priorities, requirements or schedules. The Committee will notify the design professional if it makes any revisions that would affect the design professional.

There may be some instances when the Project's failure to follow the procedure is a thoughtful assessment of priorities, as the provision cited above permits. However, the consistent failure to abide by the program procedures, minimal funds recovered, and other issues documented throughout this report strongly suggest that a simple lack of

commitment to – or priority of – the concept of cost recovery more often underlies failure to comply with the written procedures.

**Finding 8. In some cases, the Project failed to assess accurately the full cost impact of deficient design work.**

During an interview, FHWA staff told staff of the Office that early in the Project program, a resident engineer might have indicated on the change order documents a potential cost recovery action for a simple omission, such as failing to indicate the location of a manhole on the plans. According to the interviewee, “re-do” work is really the issue. That is, must work be done over at an additional cost? He stated that the cost recovery committee had essentially abandoned trying to define the term standard of care and had devised other measures for figuring out whether to pursue cost recovery. He explained that those other measures basically involved engineering judgments about what could reasonably have been expected under the circumstances and whether there seemed to be a pattern of problems with a particular designer.

The written cost recovery procedures reviewed by the Office advise the cost recovery committee to estimate “costs or damages, if any, that the Commonwealth has incurred or will incur due to the deficient performance and an analysis of the cost/benefit considerations of seeking recovery of such costs or damages. . . .” Project files contained little discussion of the cost-related analyses, and overlooked cost considerations that could have tilted the decision toward pursuing rather than closing a cost recovery matter. Cost recovery #66 illustrates this point, and shows how the area team recommendations may overlook or fail to address important cost-related issues such as increased costs and cost associated with delays.

***COST RECOVERY #66, REMOVAL OF OBSTRUCTIONS***

The Project settled two contractor claims for a total of about \$6.2 million because of problems encountered during construction of the Central Artery (I-93) between State Street and North Street (PCNs 035 and 035R1 for C17A2). According to Project documents, the contract required the winning bidder (Modern Continental/Obayashi) to remove all piles, regardless of the type, from the excavation. MassHighway legal staff for the Project filled out the cost

recovery inquiry form as part of a routine review of all change orders over \$250,000. B/PB staff had not indicated on the initial change order documents that the additional costs potentially resulted from a design error or omission.

The resulting change order replaced a single bid item in the construction contract with five separate items for removal of significant obstructions, because of the need identified during construction for a higher bid quantity for excavation. The contractor's bid of an average unit rate of \$7,500 for all piles described in the bid documents did not accurately reflect the cost of removing the piles. As a result, the Project negotiated different rates for different types of piles and a unit price for footings and piles not shown on the contract drawings.

The Project's initial cost recovery review stated that information relating to location, number, and make-up of piles was purportedly available to the SDC during design, and noted that:

[The circumstances of the change order] caused the need for partial redesign, probable contractor delay, and a claim for the extended overhead.

Nevertheless, the cost recovery committee determined that no further action should be taken based on the following recommendation from the area team:

It is our recommendation that no further action be taken. This is based on the fact that all of the work in this [change order] would be required to be completed by the contractor regardless if it was included in the design plans or not. There were no unnecessary costs associated with the work in this [change order] not being included in the design plans.

In the case of this \$6.2 million change order, the Project was apparently untroubled by defective bid specifications and disinclined to hold the designers accountable for accurate and complete work. The Project should have questioned whether the design firm acted responsibly in light of its failure to accurately estimate the number of significant obstructions. This analysis should have extended to a review of the designer's use of the same average unit rate to remove obstructions when the cost of removal should have been different for each type of obstruction. The Project should have also questioned why the designer completely omitted some physical elements from the plans.

In addition, there seem to be redesign costs and delay costs associated with the change orders that the Project ignored. The Project's closing memorandum does not clearly state the problems of underestimating the number of obstructions, the need to renegotiate unit prices and a price for time and materials work, and the failure to identify obstructions in the contract

documents. Other documents obtained by the Office refer to “the need for partial project redesign, probable contractor delay, and a claim for extended overhead.”

Under the circumstances described above, it is difficult to understand how the Project could conclude that “there were no unnecessary costs associated with the work in the change order.” The files provided no insight as to the analytical basis for the Project’s conclusion that the defective design did not increase costs.

**Finding 9. Project management eliminated an effective method for catching potential cost recovery actions that B/PB staff may have missed.**

On the Project, cost recovery cases are typically identified by the resident engineer<sup>19</sup> during the early stages of the claims and changes process. Potential cost recovery actions can be identified at any time during the change order review process, if a significant event occurs, or when a third party claim involves deficient consultant performance.

From 1995 to 1997, potential cost recovery cases could also be identified by Project legal staff during reviews of change orders valued at more than \$250,000. During the same period, Project legal staff audited a random sample of not less than five percent of executed contract modifications under \$250,000 each month. According to the Project, these reviews by legal staff were discontinued in April 1997 based on a recommendation of a Construction Contract Efficiencies Task Force. At the direction of the MassPike Chairman, Project legal staff have, since May 2000, been reviewing all construction and design contract modifications having a value in excess of \$50,000.

According to the Project’s Chief Legal Counsel, this practice (legal staff review of change orders) was a matter of management policy and was not reflected in the Project’s written procedures. Project files, such as those for cost recovery #66 and cost recovery #73 discussed elsewhere in this report, corroborate his statement that the legal department referred some matters to cost recovery as a result of its review of change orders in excess of \$250,000.

As illustrated in the previous discussions of cost recovery #66 (removal of pile obstructions) and cost recovery #73 (drainage system), the legal review identified some legitimate problems that the cost recovery process missed.

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<sup>19</sup> The resident engineer is the individual assigned as the Authorized Representative for MassPike on Project construction contracts and interagency agreements.

## ***Conclusion and Recommendations***

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The existence of a so-called “cost recovery program” should offer little comfort to taxpayers. The structure of the program provides no assurance that deficient performance will be detected and no evidence that costs incurred as a result of deficient designer performance would be pursued through the cost recovery program, even if the problem had been detected. In the context of the \$14+ billion CA/T Project, the \$30,000 recovered so far barely registers as a token nod to recovering costs.

We conclude that the Project’s primary purpose for the cost recovery program was not to recover costs, but to maximize FHWA funding for certain change orders that are eligible for federal aid. We do not question the merit of taking all reasonable steps to maximize federal funding, including creating a program FHWA requested to ensure that federal funds were provided even for change orders that may have been necessitated by deficient designer performance. However, that arrangement does not release MassPike from its obligation to pursue costs and damages on the Commonwealth’s behalf. By failing to vigorously assess and pursue potential cost recovery actions, MassPike may be missing opportunities to assertively signal designers that taxpayers will not cover the costs of deficient services and work products.

B/PB’s role in the cost recovery process is akin to the fox guarding the hen house. B/PB’s extensive role in preliminary design and final design management should preclude any role in a program – such as the cost recovery program – that purports to examine problems that may have been caused by B/PB’s own work. But B/PB controls the data.

Ultimately, B/PB’s predominant interest will rest with its parent corporations, not the Commonwealth. The Commonwealth’s over-reliance on B/PB – and B/PB’s dominant role in the Project – provides insulation from cost recovery actions and shields B/PB from any attempt by MassPike to hold the joint venture accountable through the cost recovery program for deficient design.

In March of 1999, senior level Project staff advised the Office that the Project planned to revamp the cost recovery program and would ask for the Inspector General's help with those efforts. The request never came. In fact, the Office had continual difficulty obtaining cost recovery information from the Project until recently after the new MassPike Chairman took office. Since then, the routine flow of information has improved.

Project management's interest in avoiding expensive litigation against designers must be balanced against its responsibility for recovering costs on behalf of the taxpayers and the need to set a standard for work on the CA/T Project. So far, management has sent a clear and unmistakable message to designers, including B/PB: you will not, through the cost recovery program, be held accountable for deficient design performance.

The ever-increasing share of Project costs to be funded by the Commonwealth lends extra urgency to Project leadership's responsibility to control costs and send an unequivocal message: public officials, designers, and contractors of every sort will be held accountable for their work. The cost recovery program is one such opportunity to underscore that message **and** reduce the net cost of the CA/T Project. And, to date, it has been a missed opportunity.

Project leadership should consider the following recommendations as it pursues recent efforts to revitalize its cost recovery program:

**1. Revisit the earlier decision not to regard the cost recovery program as an opportunity to cut costs or reduce the net cost to taxpayers.**

The public should not be forced to foot the bill for deficient design. Based on results, designers – including B/PB – have no reason to believe that they will be held accountable through cost recovery action for their mistakes.

**2. Use the cost recovery program to send a clear message that all design professionals on the CA/T Project will be held accountable for their design work.**

Design professionals, including B/PB in its role as design manager, must be held accountable for their work. In its neglected state, the cost recovery program does not provide an effective tool for ensuring high-quality design work and detecting substandard design performance.

**3. Reassess the basis for determining whether to pursue a cost recovery case.**

The Project may be losing millions of dollars unnecessarily because it ignores costs associated with design omissions, such as no-bid add-ons, schedule delays, resultant contractor claims, and costly delays on adjacent contracts.

**4. Avoid conflicts of interest by ensuring that MassPike or MassHighway, not B/PB, contracts directly for any services aimed at assessing B/PB's liability for design deficiencies.**

Directing B/PB to subcontract for work that includes assessing B/PB's job performance creates a conflict of interest for the consultant and may unnecessarily expose the final work product to public criticism.

**5. Delink the B/PB and MassPike organizations.**

MassPike has created an organizational structure that sets up conflicting loyalties and interests. MassPike staff, particularly those who also review B/PB's work and participate in contract negotiations, should not report to B/PB staff.

**6. Define clearly and follow through on the purpose and processes of the cost recovery program procedures. Program reassessment should include the following topics:**

- Program goals and criteria for judging program success or failure.
- Committee responsibilities, including content and frequency of reports to management.

- Criteria for determining whether to pursue cost recovery, including standard of care, and a thorough assessment of costs incurred as a result of deficient design work.
- Time frames for completing cases.
- Guidelines for case file contents and documentation standards.

7. **Provide training and guidelines to increase the likelihood that those closest to the issues in the field, including resident engineers, identify cost increases caused by deficient design.**

8. **Explore and vigorously pursue cost recovery opportunities that go beyond the current program boundaries to include recovery actions for construction management issues and indirect cost overpayments to consultants.**

The cost recovery program is limited to the matters that FHWA agreed to fund – that is, change orders involving potential design deficiencies. Project managers should consider expanding the cost recovery initiative to include other opportunities, including construction engineering errors and cost recovery against B/PB, the Project's construction manager. The Project purports to handle these matters outside the cost recovery program, but did not during the review provide evidence of any recovery of costs or damages that have resulted from such efforts.

# # # #

Senior Project managers advised the Office, during a final interview in September 2000, that they planned to release a revised version of the cost recovery program procedures imminently. According to the Acting Project Director, the revised procedures would be responsive to many of the concerns and recommendations the Office had made in the course of its review. The Project provided a copy of the revised procedures to the Office on October 19, 2000, during the final production stages of this report. The Office will review the material provided by the Project and comment, if necessary.

## ***Appendix A: Massachusetts Turnpike Authority-Central Artery/Tunnel Project Response***

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The Office provided MassPike and federal officials ample opportunity to comment orally and in writing on the results of the Office's review. The attached response indicates that MassPike management concurs with many of the report findings concerning program neglect and inadequate documentation. Project management acknowledges the need for improvement by its letter, and in steps initiated at the end of the Office's review to revitalize the cost recovery effort.

Unfortunately, aspects of MassPike's response misconstrue the scope of the review. The review focused on cost recovery program implementation and neither evaluated nor questioned the professional integrity of Project staff.

The Office carefully examined all points of apparent dispute reflected in the attached letter. Where appropriate, the Office clarified its position to avoid miscommunication. In some instances, however, observations in the letter of response do not comport with Project documents reviewed or received by the Office. For example, the Project Director states that Federal Highway Administration (FHWA) concerns were the catalyst for introducing the cost recovery program. While the observation is fully consistent with statements of FHWA officials to this Office, Project staff disputed it well into the Office's review, as reflected in item six of correspondence from the Project to this Office dated March 25, 1999.

In another instance, the attached letter indicates that although the issue may not have been adequately documented, the cost recovery committee gave the matter of anchor bolt installation "full and thorough consideration." The Office agrees that Project officials narrowly reviewed the matter and exonerated the designer of the anchor bolt system. However, the Office took issue with B/PB's role in managing the design conflict that led to the difficult anchor bolt installation. The cost recovery files made available to the Office contained no reference at all to a review of B/PB's role in the design coordination problems that led to approximately \$850,000 in change orders.

Notwithstanding Project management's strenuous objections to many of the findings and conclusions, the Office is pleased to note evidence of steps taken to remedy the problems documented in this report.



Massachusetts Turnpike Authority  
Central Artery/Tunnel Project

December 29, 2000

Wendy Haynes  
First Assistant Inspector General for Megaproject Oversight  
Office of the Inspector General  
State House Station  
P.O. Box 270  
Boston, MA 02133

RE: Revised Draft Report Regarding Central Artery/Tunnel (CA/T) Project  
Cost Recovery Procedure

Dear Ms. Haynes:

I am writing in response to your letter dated December 22, 2000, by which you transmitted a revised draft report by the Office of the Inspector General (OIG) regarding the CA/T Project's Cost Recovery Procedure.

We appreciate the opportunity to review the revised draft report, and are pleased that some of our comments to the prior draft report have been acknowledged with the publication of this latest revision. However, for the record I must express my concern about the unsubstantiated accusations impugning the professional integrity of managers from the CA/T Project and the Federal Highway Administration (FHWA). The attachment to this letter provides examples of such instances. In addition, we are disappointed with the continued misstatements about, and misinterpretations of, the information that the Project provided during the course of your over four year review.

We are also concerned that your revised draft report, while replete with criticisms, does not offer constructive alternatives to the current process. As you know, last October we implemented Revision 4 (Rev. 4) of the Cost Recovery Procedure, which was initiated not only to address the concerns the Project had about the prior process, but also to respond to some of the concerns that we heard from your office during the course of your review. We believe that you will find that many of the issues of concern that you have raised in your draft report have already been adequately resolved through Rev. 4. Our detailed response to each of your findings is attached, but let me address some of the key points raised in your draft report.

First, we agree with your conclusion that the Cost Recovery Procedure was not established to be a revenue center for the Project. In hindsight, it was inaccurate to term this effort a "Cost Recovery Procedure" since its mission is much broader than simply recovering costs. As we explained to you in many interviews, the catalyst for establishing the Cost Recovery Procedure

was a concern expressed by FHWA that it could not participate in construction costs associated with design professional errors and omissions, in the absence of a program to review whether the Project had incurred costs due to such errors or omissions. In response to this concern, the Project established the Cost Recovery Procedure in 1993 with the concurrence and participation of FHWA. To our knowledge, no other highway project has established such a procedure.

Another reason for establishing the Procedure was to ensure that the Project was exercising appropriate oversight over the delivery of professional services to the Project. As we have explained many times, the goal of the program was to establish an administrative process to review potential errors and omissions, assess the costs (if any) incurred by the Project, and decide whether it was in the best interests of the Commonwealth to pursue those claims. Further, we see the Cost Recovery Procedure as being one management tool in an arsenal of tools used to oversee the delivery of professional services on the Project. We think it is misleading for your report to conclude that "the \$30,000 recovered so far barely registers as a token nod to recovering costs." As discussed in the attached response, we also manage design professional services through proactive contract management, which has resulted in recovery or offset of over \$688,000.

We disagree with your assertion that the success or failure of the program is to be measured by a scorecard of money recovered. In fact, we feel that to implement the litigation-oriented approach proposed by the OIG would end up costing the taxpayers much more than the (unidentified) "passed up opportunities" referenced in your report.

As you well know, the Project is on a "fast track" schedule that requires all Project resources to concentrate on moving the Project forward because of the enormous costs associated with schedule delays. This approach requires that all Project participants work in partnership toward Project-established goals and priorities. It also means that the Project expects that all parties will be willing to take some risks in order to produce greater benefits. In furtherance of this approach, the Project relies on its design professionals to deliver quality services, but at the same time must be willing to accept some risk and not "over-engineer" the Project at taxpayer expense. If we were to pursue every possible mistake (and mistakes will inevitably happen on a project of this complexity), the natural response from the design community would be to refuse to cooperate in solving problems, and instead engage in defensive engineering where the designer's efforts are focused on protecting itself from potential claims rather than delivering its services as actually needed by the Project.

Second, your draft report states on several occasions that the Cost Recovery Committee did not apply a professional standard of care test. As you know, the Cost Recovery Procedure permits the Cost Recovery Committee to apply a number of tests, including the professional standard of care. It is often open to debate as to the appropriate standard of care to be applied in particular situations, let alone whether a designer breached that standard of care. Moreover, there are often mitigating circumstances that may be a defense even to errors or omissions, such as the Project

choosing to assume a certain level of risk, or simply the exigencies of keeping the Project moving on its fast track schedule. That does not, as you imply, mean that corners were cut or quality was compromised; rather, it means that acceptance of a certain level of risk of mistakes is reasonable based on management decisions as to how this Project should be built. We do agree, however, that the Cost Recovery Committee can and should better document its application of the tests set forth in the Cost Recovery Procedure.

Third, one of the underlying bases for your criticisms centers on the Integrated Project Organization (IPO). We understand that the OIG has had a long held position disagreeing with our implementation of the IPO. Likewise, we have disagreed with the OIG, since we believe that it is the appropriate organization to efficiently manage and complete this Project and, if anything, enhances our ability to manage B/PB. That said, we do not disagree with your cautionary note that, to the extent that B/PB may have caused or contributed to an error or omission, it should not be in charge of reviewing its own work. In fact, it is for that reason that the Cost Recovery Committee is comprised strictly of public staff, including a representative of FHWA. Although the Cost Recovery Procedure allows B/PB to participate in the review of Cost Recovery matters, it is within the discretion of the Cost Recovery Committee to decide when that is appropriate. The Cost Recovery Committee, in practice, does not call on B/PB for assistance unless and until it has assured itself that B/PB does not bear some responsibility in the matter. It is also important to recognize that the MTA can—and has in the past—retained outside consultants to assist in the review of matters involving B/PB. I believe very strongly that the Project's MTA staff have carried out their duties in a manner protective of the interests of the public. It is unfair for you to assert that the Cost Recovery Committee cannot discharge that responsibility because of B/PB's involvement in the management of the Project.

Fourth, we accept that there are valid criticisms of our administration of the Cost Recovery Procedure. Because the Cost Recovery Procedure contemplated an "after the fact" review, it has lagged behind other Project priorities that time and again intervene to occupy CA/T personnel's time. It is not an excuse, but a fact of life on a Project of this magnitude, that day-to-day crises inevitably intervene to delay issues that are not "mission critical." Recognizing valid criticisms from the OIG, we have undertaken the following steps that we believe have already addressed many of the issues and recommendations included in your report. We respectfully suggest that your report should more explicitly recognize these changes rather than dwell on some of the mistakes of the past:

- Appointed a new Chairman of the Cost Recovery Committee, with instructions from the Project Director to prioritize processing of all current cost recovery inquiries and improve documentation.
- Re-established CA/T Legal review of selected construction modifications.
- Provided an option to the Cost Recovery Committee to have cost recovery matters

12/29/2000

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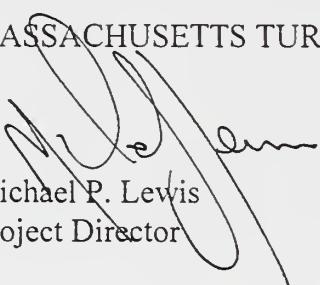
resolved at the time the issue is raised by construction changes so that resolution is not inordinately delayed.

- Tied the Cost Recovery Procedure to the Professional Liability Owner Controlled Insurance Program to streamline the process and gain more direct access to insurance monies.
- Changed the Cost Recovery Procedure to require consideration of all criteria (contract requirements, standard of care, mitigating factors, costs or damages).

In closing, we trust that you will carefully review our comments to your revised draft report. We remain open to further constructive suggestions by you to improve the process, consistent with the purpose and intent of this program.

Sincerely,

MASSACHUSETTS TURNPIKE AUTHORITY

  
Michael P. Lewis  
Project Director

attachment

cc: Andrew Natsios, Chairman, Massachusetts Turnpike Authority

2000-02013M

AD-2.4.2

**Finding 1. In six years, the Project has only recovered \$30,000 from about \$83.5 million in cost-recovery related change orders.**

**Project Response:** While the amount recovered from design professionals on the Project appears low, we believe that it is a reflection of the high caliber of design technical talent that has been attracted to the Project. This Project is one of unprecedented scope, scale and complexity. Cutting edge technologies are routinely applied in adverse conditions and under tight time constraints. As you may be aware, technical Project accomplishments are frequently highlighted in professional design and engineering journals. This has helped the Project draw expertise from all over the world to work on structures such as the cable stayed bridge, soil mixing, tunnel jacking, and concrete immersed tubes.

In addition, regarding the specific statement that the Project recovered only \$30,000, please note that this statement does not account for the Anelex settlement. This settlement included a payment of \$168,000 from B/PB, Camp Dresser & McKee, Inc., and other Anelex participants in settlement of cost recovery items related to that litigation. We acknowledge that this recovery was handled as part of the settlement and not through the Cost Recovery Procedure. However, it was analyzed and resolved as if a cost recovery matter.

On a more general level, the implication of this finding is that appropriate attention has not been applied by Project management to the oversight of the CA/T design effort. It must be recognized that the recoupment of funds is but one of the objectives of the Project's Cost Recovery Procedure. In our estimation, its purpose also is to assure that the Project receives focused and professional design services. A number of related initiatives target this important goal.

While reported recoveries through the Cost Recovery Procedure are relatively low, recovery for deficient design performance has not been limited to the Cost Recovery Procedure. In fact, section design consultants (SDCs) have, at no cost to the Project, performed remedial work worth in excess of \$688,000 (see attached spreadsheet of Project estimates). In the cases listed, the SDC acknowledged an obvious design deficiency and performed the necessary remedial work. Such work is considered "real time" cost recovery. The acceptance of responsibility for the design error by the design professional, followed by its performance of the remedial work, eliminated the immediate need for a contract modification, the document that generally triggers the formal cost recovery analysis.

During construction, the Project receives numerous Requests For Information (RFIs) from contractors relating to the design of SDC prepared drawings and specifications. The Project evaluates these issues for potential design backcharges and the reimbursement for what may be nonreimbursable design billings during the construction phase. Where appropriate, a repayment schedule is negotiated with the SDC, or, if no agreement is reached, the Project's authorized representative may initiate a unilateral contract modification (backcharge) to the SDC contract. The attachment reflects \$477,000 of backcharges to design budget pursued by the Project reflecting potential incomplete design effort that could result in potential claims. Although outside of the Cost Recovery Procedure's formal boundaries, this effort does constitute preventive management action

focused on improving delivery of professional design services.

**Finding 2. The Project set up the cost recovery program primarily to ensure federal funding, not to recover costs.**

**Project Response:** As we have discussed many times with staff from the Office of the Inspector General (OIG), the catalyst for setting up the program was, as the draft report states, the concern that FHWA would not participate in construction change orders involving potential design errors or omissions including non-compliance with the professional standard of care. However, there were other reasons for establishing the Cost Recovery Procedure. The Project concluded that the Cost Recovery Procedure could also serve as an appropriate management tool to ensure that design professionals delivered appropriate services as required by their contracts and by the professional standard of care. The draft report's statement that "...the Project continued to invest in this program, despite its failure to yield results," ignores the preventative benefits of having such a program in place. The Project believes that the existence of the procedure sends a message to the design community that professional errors and omissions will be reviewed and resolved. We believe that this has an appropriate influence on designers adhering to the requirement of delivering quality services.

As the Cost Recovery Procedure provides, in appropriate circumstances, the intent of the program is to recover costs. However, it must be recognized that in a given cost recovery matter, the Commonwealth may not incur costs that are beyond those that would have been expected for the underlying work. If no additional costs were incurred, then there is nothing to "recover". Although we agree that the documentation could be better, the Project firmly believes that, in those instances where recovery was appropriate, it had recovered the identifiable costs.

We also take exception to the draft report's assertion that "the Project passed up opportunities to recover costs and to send the clear message that MassPike will hold designers accountable for their work." First of all, we are unaware of any instance where the Project failed to pursue recoverable costs which were greater than the cost of recovery. If the OIG has evidence to the contrary, please let us know immediately. Secondly, to state that the Project needs to send a message that designers will be held accountable for their work demonstrates a profound lack of understanding of the day to day interactions between Project officials and the Project's designers. Through strong contract administration, the Project has delivered--and will continue to deliver-- that message quite clearly.

As noted in our response to Finding 1 above, we have brought to your attention that many design/engineering issues on the Project have been reviewed and resolved outside of the Cost Recovery Procedure. To date, they have been viewed as contract administration issues. In the future we intend to ensure that these matters are resolved within, or at least reconciled with, the Cost Recovery Procedure so that the wider range of design professional management efforts can be captured. We urge you to recognize these efforts in your final report, especially to the extent you deem our management success or failure to be measured by dollars captured.

**Finding 3.** B/PB's overly broad role in Project management undermines the Commonwealth's ability to hold B/PB accountable for its design work.

- 3a. The Project failed to pursue cost recovery against B/PB.
- 3b. Changes to the cost recovery procedure reflect the Project's increased reliance on B/PB.
- 3c. Internal organizational relationships impede MassPike's ability to hold B/PB accountable for its performance.
- 3d. B/PB's conflicting interests in the cost recovery program serve as yet another example of the vulnerabilities of the current contractual arrangement.

**Project Response:** We disagree with these assertions and believe they take an overly simplistic view regarding the design/engineering aspects of the Project. B/PB is held accountable for its design work as evidenced through the contractual language contained in Work Program 14 (including but not limited to: Attachment A-1, Section 3.2 "Standard of Care"; Attachment A-9, Section 3.2 "Responsibilities of the Management Consultant", Section 3.3 "Management Consultant's Liability to the Department", and Section 3.4 "Management Consultant's Indemnity").

In addition, the draft report's allegation that "...because of B/PB's involvement in nearly every aspect of the Project, it is difficult to identify a situation where B/PB is not potentially responsible for a design error or omission" fails to recognize the distinct and potentially opposing roles of B/PB and the SDCs on the Project. Problems or issues associated with the preliminary design produced by B/PB can be reassessed and addressed once the SDC joins the Project. Although B/PB is responsible for preliminary design, the SDCs are accountable under contract to the MassHighway Department and the Massachusetts Turnpike Authority. The SDCs are ultimately responsible for producing and stamping final designs. The act of stamping a design means that the SDC, as the final designer, is taking full responsibility for the integrity of the design.

In alleging that the Project failed to pursue cost recovery against B/PB regarding installation of anchor bolts during construction of the Ted Williams Tunnel, the draft report omits the fact that the change was not precipitated by a design error. As the Project explained in great detail to OIG staff when this issue was first raised several years ago, this situation was not one which could have been anticipated. As the Project's letters to your office dated August 10, 1998 and December 23, 1998, indicated regarding this matter:

Your report seems to suggest that our specifications should anticipate every possibility and circumstance. What is more important is a system, reflected in our specifications, that recognizes the possibility of changed circumstances, gives us the flexibility to adapt, and allows us to solve problems before they affect our schedule.

To state the unfounded supposition, as the draft report does, that "apparently MassPike had already decided to let B/PB off the hook," unfairly and unjustly impugns the integrity of the

Project's public managers. While this issue was not perhaps adequately documented, the Cost Recovery Committee did give this matter, as it does all cost recovery matters, full and thorough consideration.

Finally, the draft report raised concern about B/PB staff participation in cost recovery issues. While it is permissible for B/PB staff to participate in discussions of cost recovery issues, the Cost Recovery Committee--all public employees at senior levels within their organizations--decide when such participation is warranted, and only after they have assured themselves that B/PB does not bear some responsibility in the matter.

**Finding 4. Project management directed B/PB to subcontract for the services of the consultant responsible for assessing B/PB's potential liability for cost overruns.**

**Project Response:** The draft report correctly states that Peterson Consulting, under contract to MassHighway in 1995, provided cost recovery services to the Project, including the review of a potential cost recovery issue related to Fort Point Channel. As also noted in the draft report, the Project directed B/PB to subcontract for the services of the project leader of the Peterson Consulting effort, who had since joined Barrington Consulting, for additional cost recovery services.

However, the draft report misleadingly states that "the consultant charged with assessing B/PB's potential liability for cost overruns was working under a subcontract with B/PB". This statement might lead to the incorrect conclusion that the consultant's independence thus would be compromised. The draft report fails to note that B/PB served simply as the paymaster for the subcontract held by Barrington. All work performed by Barrington was at the direction of senior public Project staff and all invoices associated with this work were approved by senior public Project staff. Documented task orders exist for all work performed by Barrington, and all task orders reflect the signatures of the senior public Project staff who were the technical representatives for this subcontract. We are disappointed that the draft report neglects to mention these important points, especially given the fact that the OIG staff had access to all such documentation of public managers' direction and approval of Barrington's work.

**Finding 5. The cost recovery program shows serious signs of neglect.**

- 5a. On average, Project staff took more than a year (394 days) to close cost recovery cases.**
- 5b. The Project lost or misplaced many cost recovery files.**
- 5c. The Project does not, under the cost recovery program, actively pursue alternative methods of cost recovery.**
- 5d. CA/T Project managers limited the cost recovery program to design-related issues.**

**5e. Many of the cost recovery case files are incomplete.**

**Project Response:** We recognize that closer attention could have been paid to the Project's Cost Recovery Procedure. Relatively few cases have been opened following the first three years of the program and some cases have remained open longer than originally anticipated. The Project has, however, made significant progress recently, as correspondence to the OIG demonstrates.

Not only has the Project closed cases that were opened under Revisions 1 - 3 of the Procedure (see the Project's October 27 letter to the OIG concerning the closing of six cases), it has also published Revision 4 of the Cost Recovery Procedure. Project staff are currently processing at least 50 new cost recovery cases for imminent review under Revision 4. Further, training of appropriate personnel has also been initiated.

A copy of Revision 4 was provided to the OIG in October, in advance of the December 22 publication of its revised draft report, yet the report makes no mention of it.

Although Project efforts have been directed primarily toward closing existing cases and developing Revision 4, reconstructing the missing files also remains a priority. The Project remains committed to addressing cost recovery matters in a timely fashion and to documenting the relevant facts and deliberations.

Cost Recovery #39 (Wall thickness change) is illustrative of the thoroughness of the review process and the recognition of the complexity of the Project and the need to avoid costly delays to construction progress. Although the Cost Recovery Committee disagreed with the area team's initial recommendation that no further review be undertaken, the Cost Recovery Committee eventually recommended against pursuing recovery. This was not as a result of what the report terms a letter from the designer which "vigorously challenged the Project's actions," but as the result of discussions with the area team and in recognition of the facts that a problem with shop drawings was spotted in the field by the field engineer and the design professional, that the design professional worked to solve the construction problem without delay and, consequently, that the design professional had met the applicable standard of care. (See the Disposition Memorandum in the File). The Project Director did sign the Cost Recovery Inquiry Form in June 1998 (also in File), concurring that no further action was warranted.

We also take exception to your assertion that the Cost Recovery Procedure limits the type of errors or omissions that will be reviewed. The Cost Recovery Procedure applies to all professional services on the Project. It is not, as the OIG report states, limited to "instances where design work may have contributed to the cost or actually caused the need for change orders or contract add-ons." We cannot find these limitations as referenced in your report.

**Finding 6. The Project does not adequately document cost recovery cases.**

**6a. The unsigned and undated closing memoranda contain information that is not**

in the records in the file.

6b. The Project's closing memoranda do not accurately document the review process or adequately document the cost recovery committee's rationale for recommending no further action.

**Project Response:** The Project acknowledges that at least some of its cost recovery cases are poorly documented, particularly with regard to the deliberations of the area teams and the Cost Recovery Committee. However, we do not agree that, as the draft report charges, those files contain little useful information. Furthermore, although documentation may be brief, decisions have always been made in a thoughtful, deliberate manner. The Project does recognize the importance of documenting fully the decision-making process and will provide a fuller accounting of that process as it closes the remaining open cases initiated under Revisions 1 - 3 of the Cost Recovery Procedure and for those cases being initiated under Revision 4.

As the draft report notes, the Project has adopted the practice of summarizing a case with a Disposition Memorandum. The fact that such Memoranda are prepared by other Project staff, not by Cost Recovery Committee members, is not reason to question the accuracy of the information contained therein. The Cost Recovery Committee has reviewed and continues to review all such memoranda, which stand as its understanding of each issue and its position.

The documentation for Cost Recovery #72 (Dewey Square 30-inch gas alignment) is admittedly rather sparse but, having revisited the issue once again, the Project is confident that it considered this matter fully. By way of background, this issue arose out of the need to re-align a 30-inch gas line on the C11A1 contract. The issue identified for cost recovery review was that the soil cover was less than what was shown on the tunnel plans. It was determined that, although the SDC's plans contained as-built drawings, modifications to the gas line were not available to the design consultant for inclusion in the drawings. The Project considered that, had the actual location been known, the elements of this change order would have been part of the bid, therefore, the Project would have paid for this.

Regarding Cost Recovery #40 (Fire water line), the Project concurs that every step of the decision process was not fully documented. However, the Project believes that there was a thorough review and judgement applied at the time and a reasonable decision was reached. Regarding Cost Recovery #73 (Drainage system - North Drumlin), the Project concurs that this file lacks proper documentation and will endeavor to improve its practices in the future.

**Finding 7.** The cost recovery procedure does not mandate the use of stated criteria nor does it provide adequate guidance for identifying and pursuing cost recovery actions.

7a. The cost recovery program, as currently implemented, fails to provide guidelines or training to staff members, including resident engineers, who are closest to the issues.

7b. The cost recovery procedures do not adequately describe the responsibilities and

**objectives of the cost recovery committee.**

**7c. The Committee may revise the procedures without written justification.**

**Project Response:** We strongly disagree with these findings. The Cost Recovery Procedure clearly describes that the Cost Recovery Committee is to take into account the following criteria:

1. The terms of the applicable contract.
2. The professional standard of care.
3. Any extenuating or mitigating factors.
4. An estimate of the costs or damages that the Project incurred or will incur.

We are not sure how this could be drafted more clearly. In any event, Revision 4 of the Cost Recovery Procedure requires consideration of all criteria, so we must disagree with your assertion that the Cost Recovery Procedure “invites suspicions that factors having no legitimate role in a fair, impartial analysis could have influenced the committee.” With respect to matters handled under prior versions of the Cost Recovery Procedure, if you have any evidence that the Committee was, as you imply, improperly influenced by other criteria, we urge you to bring that to our attention. If you do not have such evidence, we urge you to reconsider your assertion.

The underlying premise of your critique seems to be that the sole criterion is the “professional standard of care”. We disagree. Our lawyers advise us that it is easier to assert a claim against a design professional based on violation of its contract. In the first instance, therefore, the Cost Recovery Committee should review whether the design professional breached the terms of its contract. If it did, and that is the cause of the damages, a breach of the standard of professional care is irrelevant.

If there is no breach of contract, the Cost Recovery Committee should next review whether there has been “negligence,” or, in other words, a breach of the professional standard of care. This is always a more difficult issue to decide as a management matter and prove as a legal issue. These claims are often difficult to prove in court because it becomes a “battle of the experts” as to (a) what the appropriate standard of care was and (b) whether that standard of care was breached in a given instance. Therefore, in the view of the Project’s lawyers, it is always preferable to analyze a cost recovery issue in the context of breach of contract, and reach the standard of care issue only if required.

We also note that even if the Project could prove a breach of contract and/or the professional standard of care, there must also be “damages.” In many instances, the issue is not the required construction work itself, but instead whether the Commonwealth paid a premium for the work. This is often difficult to establish, and must be weighed against the cost of pursuing the matter in Court and the “hidden” cost of encouraging Project designers to practice “defensive engineering.”

Relating to the need for training of appropriate personnel, we agree that resident and field engineers, along with claims and changes analysts, should be provided periodic training to promote an

understanding of our Cost Recovery Procedure. We also concur with the statement that we have been unable to provide documentation that training was provided when the Project's Cost Recovery Procedure was first introduced although we still believe that this was provided. What has been accomplished is the recent development of an orientation program and appropriate training aides to assist in promoting our program. During the past month, Area Construction Managers and Resident Engineers have received training in the latest revision of the Cost Recovery Procedure's guidelines.

We also disagree with your statement that the Cost Recovery Procedure does not adequately describe the responsibilities and objectives of the Cost Recovery Committee. To the contrary, the Cost Recovery Procedure describes in great detail all of the duties and responsibilities of the Cost Recovery Committee. The citations from the MWRA program, although laudable, do not in our view add anything to this analysis. The CA/T Project's Cost Recovery Procedure does capture these concepts, even if the words you quote are not used. For your information, we have contacted the MWRA and they have confirmed that the basic purpose of their cost recovery program is to review design errors and omissions, generally consistent with that of the CA/T Project.

Finally, the draft report criticizes the Project for permitting the Cost Recovery Committee some flexibility in revising the procedures and timing based on Project needs and priorities. We believe that providing the Committee with some flexibility in applying the procedure is appropriate and necessary given the complexities and pressures on the CA/T Project. We note that this can be done only with the approval of the Project Director, and although not explicitly stated, would be done in writing for the purpose of providing a record.

**Finding 8. In some cases, the Project failed to assess accurately the full cost impact of deficient design work.**

**Project Response:** Since the draft report cites only one cost recovery item (described below) in support of this finding, it is difficult for the Project to respond to this assertion. If the OIG has other examples which it believes support this finding, we would welcome the opportunity to review them.

It is important to note that Project staff have given due consideration to each cost recovery issue. In light of the unprecedented scope of the Project, any review of professional services must take into account the circumstances under which the services were performed, including the need to minimize the cost impact of delays to construction. For each cost recovery case, having considered the applicable circumstances, contractual requirements, and standard of care, the Project has balanced the strength of its case against the potential for additional expense if recovery were pursued.

As discussed above, the Project acknowledges that for some cost recovery inquiries it has not sufficiently documented its consideration of whether the design professional's services met the applicable standard of care. Yet, for all cases, it has considered the quality of those services and held them up to the applicable standard of care. For the cases it is now bringing to a close and for all cases to be reviewed under Revision 4 of the Cost Recovery Procedure, the Project will document more

thoroughly its deliberative process.

With regard to Cost Recovery #66 (Removal of Obstructions), this case grew out of the C17A2 contractor's discovery, during excavation, of a number of timber piles and abandoned foundations supported by concrete-filled Raymond step-ladder piles, with Steele driving shoes at the pile bases. These foundations were not indicated in the C17A2 contract documents. Far from being "untroubled by defective bid specifications and disinclined to hold the designers accountable for accurate and complete work" as the report contends, Project management instructed B/PB to "review the background of [PCN #35] to ensure that this is not a systemic problem in the Downtown Construction Area (memorandum dated September 5, 1996)."

This 17A2-pile obstruction issue was among the issues that led to the formation of the PCA Task Force. One of the subcommittees that the Task Force established was the Geotechnical Differing Site Conditions Subcommittee. The Subcommittee studied the geotechnical differing site condition change and recommended ways to minimize expenditures associated with subsurface obstructions. Those recommendations, and other measures summarized below, were implemented:

1. Composite drawings were developed for known subsurface obstructions.
2. Contract specifications were developed such that the costs associated with removing unknown obstructions are included in the base contract price. Unit pay items were also established for these unknown obstructions, and the specifications were also written such that the time and costs associated with 125% of the estimated quantities are included in the base contract.
3. Design Policy Memorandum No. 48 was revised to require section design consultants to include specific baseline geotechnical data in the Design Summary Report for each contract.

In hindsight, for anyone not knowing the existence of these then-unknown piles, it is easy to question the SDC's judgment. However, while review of the SDC's performance was admittedly not well documented in the Cost Recovery file, it was determined at the time that the SDC met the requirements of the contract and applicable standard of care in developing appropriate specifications.

**Finding 9. Project management eliminated an effective method for catching potential cost recovery actions that B/PB staff may have missed.**

**Project Response:** We do not agree that the elimination of CA/T Legal review of construction modifications materially affected referral of cost recovery matters to the Cost Recovery Committee. However, since May 2000, at the direction of Chairman Natsios, CA/T Legal has reviewed selected construction modifications. Therefore, to the extent there was any issue with the CA/T Legal referral of cost recovery issues based on the review of construction modifications, this finding has been rendered moot.

## CA/T PROJECT RESPONSES TO OIG RECOMMENDATIONS

Recommendation 1: Revisit the earlier decision not to regard the cost recovery program as an opportunity to cut costs or reduce the net cost to taxpayers.

Response: The Project does regard the Cost Recovery Procedure as an opportunity to reduce the net cost of the CA/T Project to taxpayers.

Recommendation 2: Use the cost recovery program to send a clear message that all design professionals on the CA/T Project will be held accountable for their design work.

Response: The Project believes that that message has been sent to the design professional community. The Project is committed to continuing to send that message, using all available management tools, including the Cost Recovery Procedure.

Recommendation 3: Reassess the basis for determining whether to pursue a cost recovery case.

Response: The Project's basis for determining whether to pursue a cost recovery case is sound. It would not be prudent, however, to pursue a cost recovery case if the costs of such a pursuit outweighed the recoverable costs. If the OIG has evidence of cost recovery matters that the Project failed to pursue, we would welcome your input.

Recommendation 4: Avoid conflicts of interest by ensuring that MassPike or MassHighway, not B/PB, contracts directly for any services aimed at assessing B/PB's liability for design deficiencies.

Response: Provided that public managers assign, direct and approve such contracts and use B/PB simply for payment purposes, the Project does not agree with this recommendation.

Recommendation 5: Delink the B/PB and MassPike organizations.

Response: The Project believes that the Integrated Project Organization (IPO) strengthens MTA's control over its management consultant.

Recommendation 6: Define clearly and follow through on the purpose and processes of the cost recovery program procedures.

Response: With the implementation of Revision 4, the Project believes Cost Recovery Procedures

are appropriately defined. The Project is committed to emphasizing the timely processing and documenting of cost recovery matters.

Recommendation 7: Provide training and guidelines to increase the likelihood that those closest to the issues in the field, including resident engineers, identify cost increases caused by deficient design.

Response: Training has been instituted and will be monitored to ensure that appropriate personnel are adequately trained.

Recommendation 8: Explore and vigorously pursue cost recovery opportunities that go beyond the current program boundaries to include recovery actions for construction management coordination issues and indirect cost overpayments to consultants.

Response: The Project's proactive approach to cost containment, contract administration, and cost recovery opportunities in these areas will continue.

# SDC Remedial Work and Potential Backcharges

Contract	Remedial Work Performed By SDC At No Cost	Potential Backcharge	Comments
C01A3		\$7,000	
C01A6		\$6,000	
C09A7			
C09B1	\$75,000		SDC absorbed \$75,000 in remedial work related to form removal from roof section.
C09B2		\$1,500	
C09C1		\$2,000	
C11A1			
C12A3	\$191,025	\$600	\$183,024.53 in design costs and \$8,500 in construction costs
C15A1	\$350,000	\$250,000	
C15A2			(incl 15A2 & A3)
C15A3 (16A)			
C17A1			
C17A2			
C17A2			
C17A3			
C17A3			
C17A9			
C17A9			
C19B1		\$150,000	
C19B8		(incl 19B8)	
C19 D1		\$50,000	
C19D3			
C19E1			
C19E7	\$62,373		Pedestrian bridge related costs
C20B2			
C22A2		\$10,000	
M025A	\$10,000		Estimated costs; could be verified through extensive search of old records.
<b>TOTALS</b>	<b>\$688,398</b>	<b>\$477,100</b>	

## ***Appendix B: Federal Highway Administration Response***

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U.S. Department  
of Transportation  
Federal Highway  
Administration

55 Broadway, 10<sup>th</sup> Floor  
Cambridge, MA 02142

In Reply Refer To: HCA-MA

Central Artery/Tunnel (C/A/T)

December 8, 2000

Ms. Wendy Haynes  
First Assistant Inspector General  
For Mega-project Oversight  
State House Station  
P.O. Box 270  
Boston, MA 02133

**Subject:** Cost Recovery Program

Dear Ms. Haynes:

The Cost Recovery Program, developed and utilized on the Central Artery/Tunnel (C/A/T) Project, was the subject of a review by your office. A draft of the report resulting from that review was submitted by your letter dated November 29, 2000. As you are aware, Cost Recovery Programs dealing with potential Errors and Omissions (E&O) issues are very limited. Potential enhancements to this Program are always sought and suggestions welcome. Your report includes several potential improvements, including better documentation and more timely actions.

We recognize that your draft report was responsive to some of our earlier concerns and we appreciated the opportunity to discuss those issues with you. We feel our comments would be appropriate in addressing three issues in your report. The first issue concerns your measure of effectiveness, which is solely based on the amount of funds recovered. The success of the Program is more aptly defined as a function of the potential E&O issues reconciled. Issues without reconciliation would be an indication of a weakness in the Program, not the amount of funds recovered. Secondly, the report refers to "missed opportunities," without any specific case being mentioned. Specific examples would be beneficial in order to evaluate the cause and develop corrective action. Lastly, the report makes a connection to the Integrated Project Organization, which we believe, based on our intimate knowledge of the process, has no direct bearing on the Cost Recovery Program.

We were happy to assist you in understanding the Program and the views promoting its success. We believe addressing E&O issues in a systematic program is very important. Your review highlights various shortcomings of the current C/A/T Program. There is very limited experience nationally with programs of this nature. Therefore, we would encourage you to focus your findings and recommendations in a manner that would improve the Program. Please contact us if we can be of further assistance.

Sincerely yours,

Bradley D. Keazer  
C/A/T Project Administrator

cc: M. Lewis (MTA/03-10-01)  
J. Allegro (MTA/03-2X-08)  
K. Dettman (03-9X-01)

## ***Appendix C: Glossary of Terms Frequently used in Discussion of Design and Construction of the Central Artery/Tunnel Project***

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**B/PB** – Bechtel/Parsons Brinckerhoff, the joint venture comprised of Bechtel Corporation and Parsons Brinckerhoff Quade and Douglas hired in 1985 to manage design and construction of the CA/T Project.

**Central Artery/Tunnel Project** – The Central Artery/Tunnel Project, often referred to as the CA/T Project, a publicly funded \$14.1 billion construction project in Boston, Massachusetts. (See also, “Project.”)

**construction management responsibilities, B/PB –**

- Providing construction planning services, including performing constructibility reviews on all conceptual, preliminary and final design packages to provide recommendations for construction staging and sequencing, maintenance of traffic, cost mitigation, and claims and conflict avoidance.
- Providing the following other construction management services: Area office services, resident field office, construction support services, partnering program, changes and claims administration, industrial relations, Project Safety and Health Services Program, and Emergency Preparedness.

**cost recovery** – Broadly used, “cost recovery” is the process by which “public and private owners file claims against design and construction management professionals for the costs claimed to be attributable to errors, omissions, or other ‘deficient’ or unsatisfactory performance (‘cost recovery claims’).”<sup>20</sup>

**design management responsibilities, B/PB –**

- Providing a design management organization composed of qualified staff on dedicated assignment to the Project Office for the duration of the Contract period.
- Managing the provision of its own and section design consultants’ design services, including coordinating the work of all design disciplines toward achievement of Project objectives related to engineering and design requirements, aesthetics, schedules, costs, environmental permit conditions, and other commitments.

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<sup>20</sup> David J. Hatem, “Errors/Omissions Cost Recovery Claims against Design and Construction Management Professionals.” The CA/T Professional Liability Reporter 1.4 (1996): 1.

- Providing engineering support during construction and documenting all new and innovative technology developed as part of the Project in accordance with FHWA's Technology Transfer Program.
- Maintaining the availability of a group of recognized experts in engineering, architectural, environmental, and other technical disciplines relevant to the Project, and providing the services of these experts as required to obtain advice, expert opinions, and review of design problems of a special nature.

**design professional** – The term “design professional” refers to the project architect and/or engineer.<sup>21</sup> For purposes of MassHighway’s CA/T Cost Recovery Procedure, the term “design professional” refers to B/PB and any other entity performing professional services in connection with the design of the CA/T Project (including construction phase services) and shall include Section Design Consultants, Area Geotechnical Consultants, and any other professional consultants or subconsultants supporting the CA/T Project design effort.

**errors and omissions (E&O) insurance** – Professional liability or malpractice insurance, which covers the professional negligence of design professionals.<sup>22</sup>

**fast-track construction** – Fast-track construction involves the commencement of construction before all of the design is completed.

**FHWA** – Federal Highway Administration, the entity within the U.S. Department of Transportation that oversees state-level projects that receive federal-aid highways funds.

**MassHighway** – Massachusetts Highway Department, formerly known as the Massachusetts Department of Public Works, is the official designated recipient for federal-aid highway funds to Massachusetts. As such, MassHighway officials sign most Project contracts, including the management consultant contracts with B/PB, the final design contracts with SDCs, and the construction contracts.

**MassPike** – Massachusetts Turnpike Authority, the independent state entity responsible for owning, operating and maintaining the MHS, including Project-related facilities as each segment is completed. Under a 1997 agreement with MassHighway, MassPike oversees the B/PB consulting contract for managing design and construction of the Project.

**megaproject** – The publicly funded design and construction of a public works project estimated to cost in excess of \$1 billion.

<sup>21</sup> Neal J. Sweeney, et al., eds. Smith, Currie & Hancock’s Common Sense Construction Law (John A. Wiley & Sons, Inc., 1997) 64.

<sup>22</sup> Robert F. Cushman, et al., eds. Construction Litigation, Representing the Owner, (John Wiley & Sons, Inc., 2nd edition, 1984, 1990) 64.

**MWRA** – Massachusetts Water Resources Authority, the quasi-independent state authority created by the State Legislature to manage the court-ordered clean up of Boston Harbor – another multibillion dollar publicly funded megaproject – among other responsibilities.

**MHS** – Metropolitan Highway System. Project responsibility has shifted with the enactment of Chapter 3 of the Acts of 1997, which established a plan for operating and financing a network of roadways, including the Central Artery and the Ted Williams Tunnel, called the Metropolitan Highway System (MHS). The law, codified as M.G.L. c.81A, empowers the Massachusetts Turnpike Authority to “own, construct, maintain, repair, reconstruct, improve, rehabilitate, finance, refinance, use, police, administer, control and operate” the MHS.

**MOD** – Contract Modifications (MODs) are written notices to a contractor that identify proposed contract changes. An approved MOD contains the scope, cost, and estimated time impact of the change. See also: PCN.

**PCN** – Pending Change Notices (PCNs) were written notices to a contractor that identified proposed contract changes. An approved change order contained the scope, cost, and estimated time impact of the change. The Project now refers to change orders as contract modifications (MODs).

**preliminary design** - Design materials that will serve as the basis of final design for the Section Design Consultants, representing approximately 25 percent of the total design effort when completed.

**Project** – The Central Artery/Tunnel Project, often referred to as the CA/T Project, a publicly funded \$14.1 billion construction project in Boston, Massachusetts. (See also, “Central Artery/Tunnel Project.”)

**resident engineer** - The resident engineer is the individual assigned as the Authorized Representative for MassPike construction contracts on the Project and interagency agreements.

**section design consultant (SDC)** – The SDC completes the final design package based on B/PB’s preliminary design.

**standard of care** – A designer’s normal standard of care is “exercis[ing] that standard of reasonable care required of members of [his or her] profession.” Anthony’s Pier Four, Inc. v. Crandall Dry Dock Engineers 396 Mass. 818, 823, quoting Klein v. Catalano, 386 Mass. 701, 719 (1982).

**work program** - One of a series of 14 contracts between MassHighway and B/PB, only the first of which was competitively procured. At this writing, project managers plan to begin work program 15 in February 2001.





